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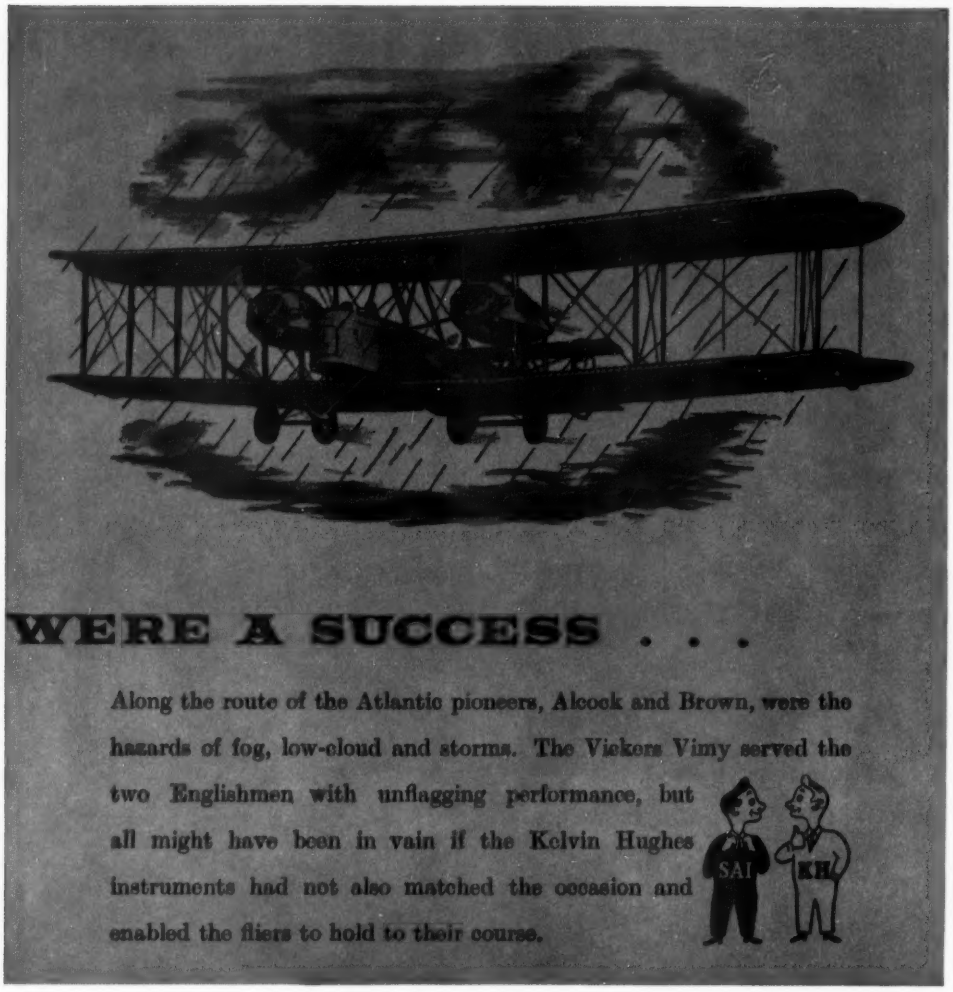

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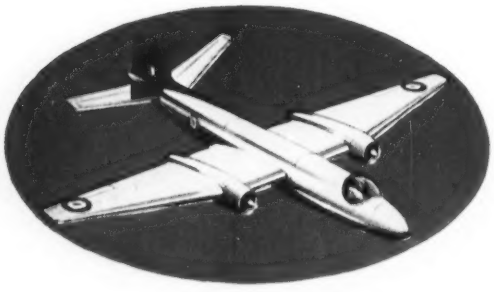

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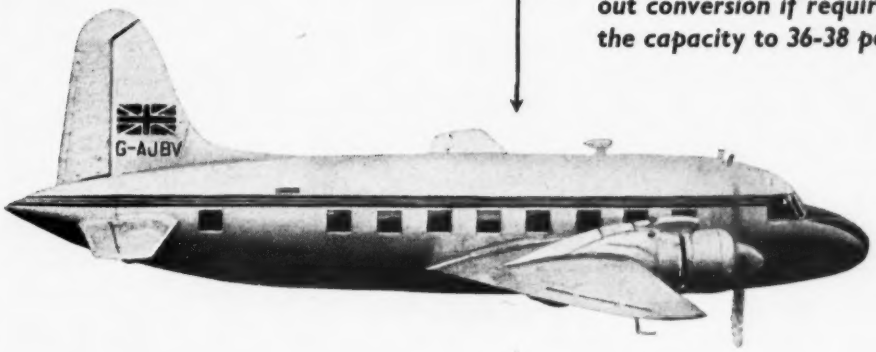

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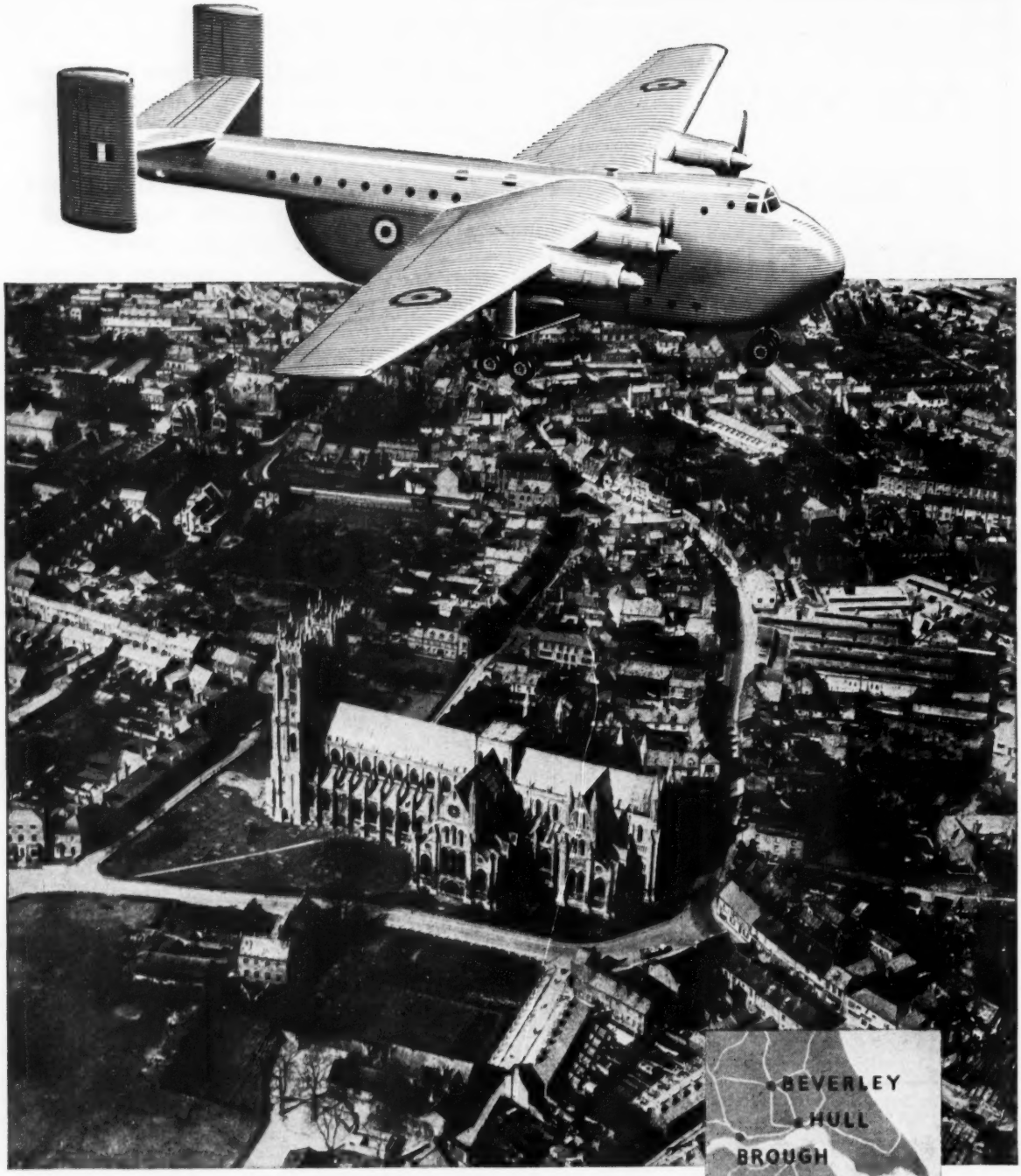

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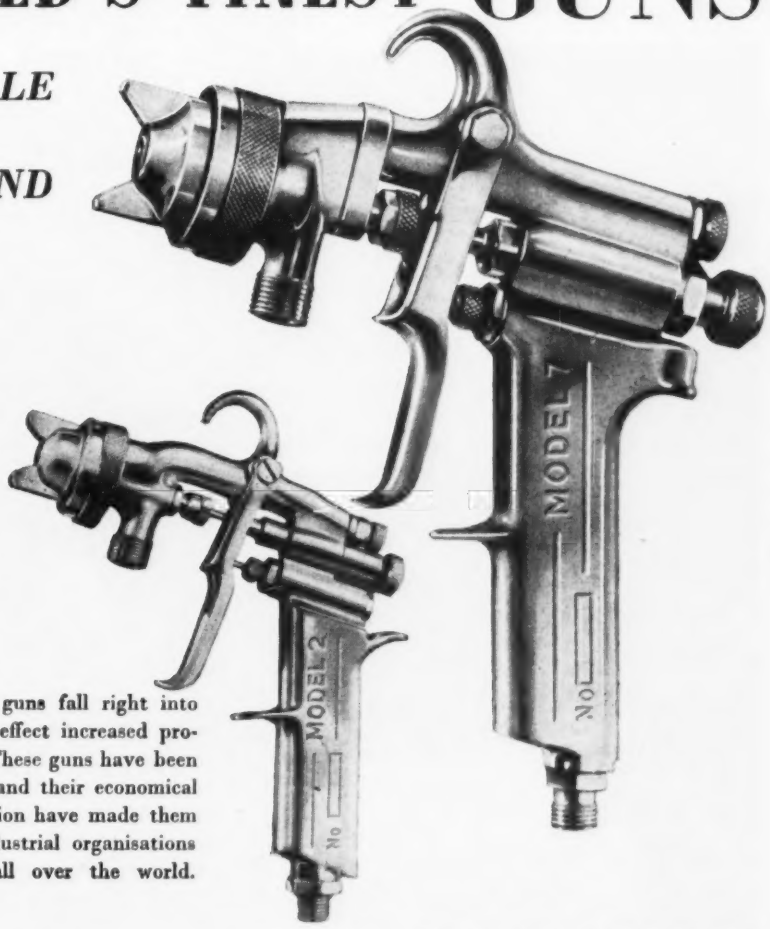

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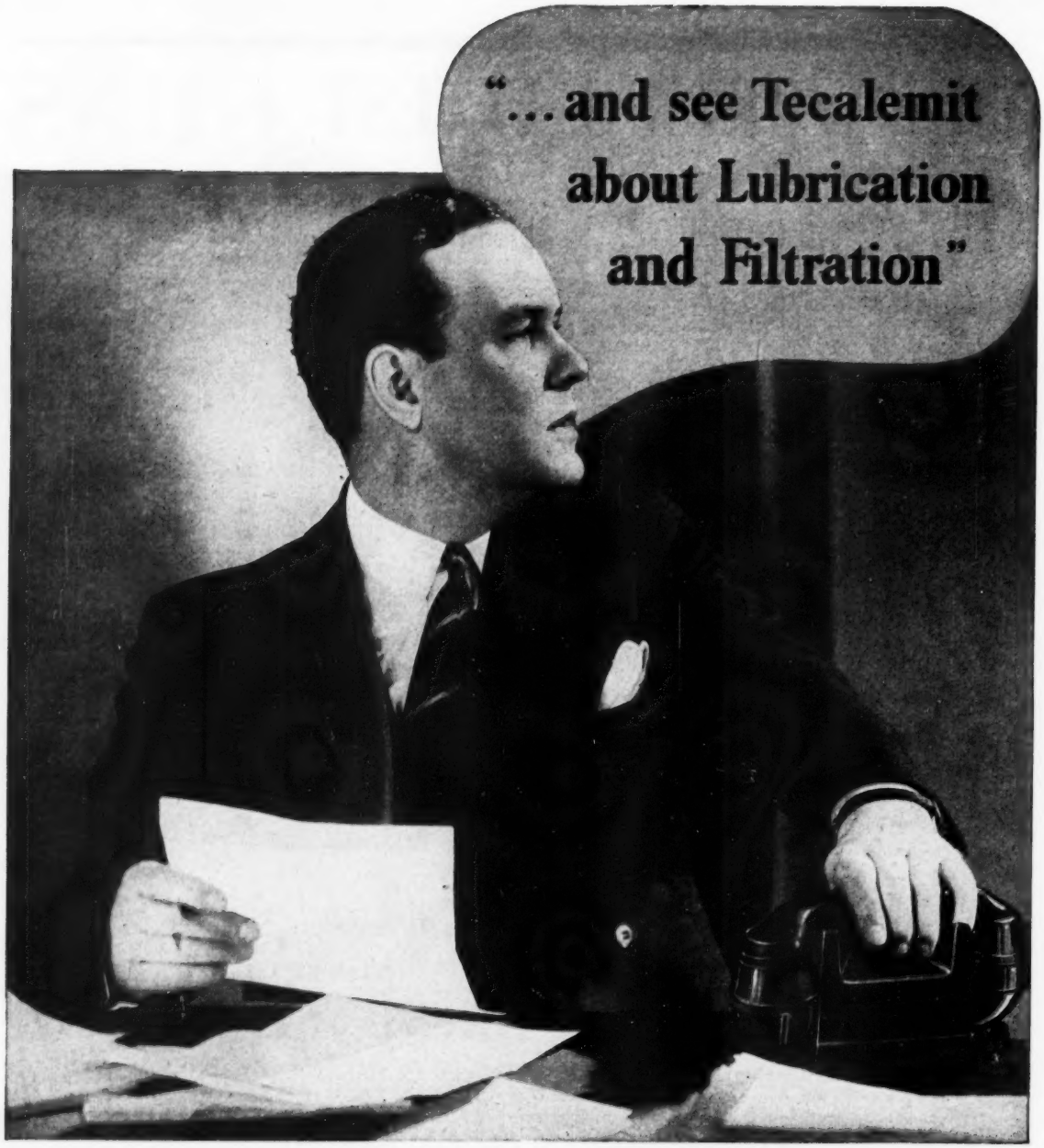

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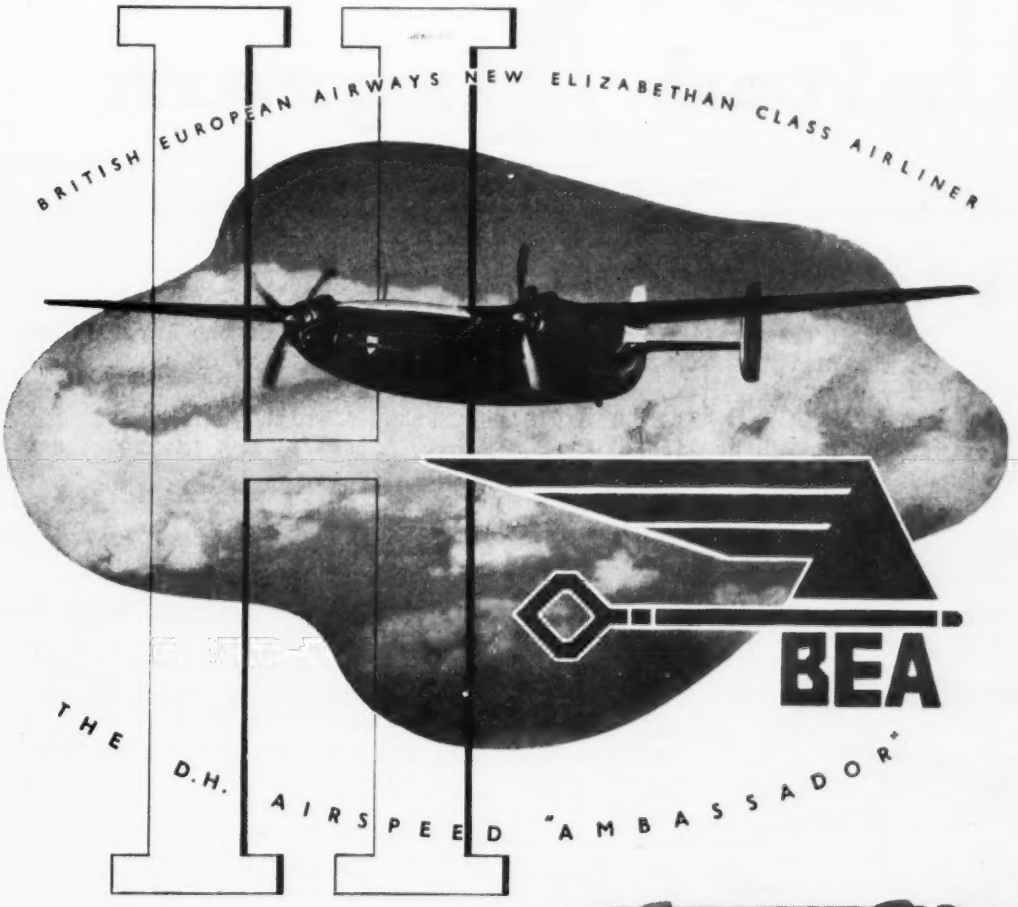
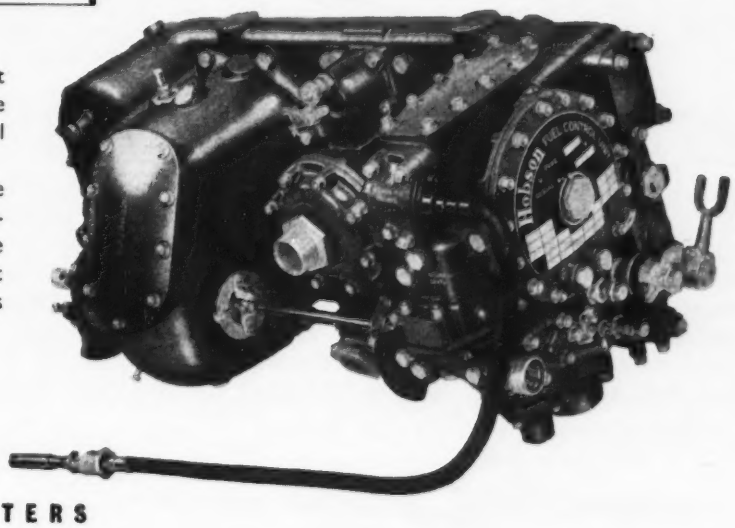


The latest addition to the fleet of aircraft in service with the B.E.A., the handsome Ambassador is now in regular operational use.

Its two Bristol Centaurus engines are fitted with Hobson B.C.15 Injection Carburetters—one more indication of the wide esteem in which Hobson equipment is held by aircraft and engine designers throughout the industry.



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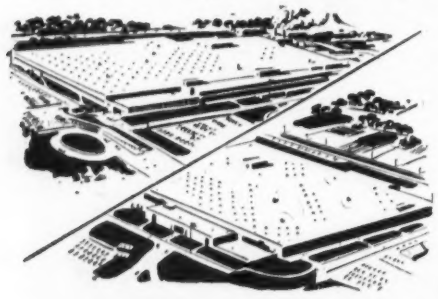
UNITED AIRCRAFT EXPORT CORPORATION

UNITED AIRCRAFT CORPORATION COMPLETES RECORD EXPANSION

In 1952, United Aircraft Corporation completed the major phases of the largest expansion program in its history while maintaining an increasing flow of aviation products to military services and commercial consumers, the Corporation's president, H. Mansfield Horner, reported. All four divisions, Pratt & Whitney Aircraft, Hamilton Standard, Chance Vought Aircraft and Sikorsky Aircraft, put important new designs into production.

TWO NEW FACTORIES BUILT, TWO ENLARGED

Two new factories were built and major expansion of two others was accomplished during the year as part of a privately financed $40,000,000 building program. The Hamilton Standard division occupied a new plant in mid-year. Pratt & Whitney moved part of its engine building work into the factory vacated by Hamilton Standard, and also occupied an additional new plant. The Sikorsky Aircraft division enlarged its facilities by a third. At year's end, more than 1,500,000 square feet of floor space had been added by United's manufacturing divisions, and the corporation had a total employment of over 46,000 persons. This number is expected to rise substantially this year.



PRATT & WHITNEY ENGINE PRODUCTION INCREASED

Pratt & Whitney Aircraft further enlarged the scope of its engine building program in 1952. The big J-57, widely described as the most powerful jet engine now flying in this country, moved from the flight test stage to installation in aircraft designed specifically around it. In April both the Boeing YB-52 and the Convair YB-60 made successful maiden flights, each powered by eight J-57s which maintained their record of high thrust and low fuel consumption. The Air Force also selected the J-57 for use in several of its advanced new fighter planes. Details of this engine are still classified as confidential by the U.S. Government.

The 5,700-horsepower T-34 axial-flow propeller-turbine engine was selected for installation in experimental military transports for the Navy and Air Force. Also in 1952 the division began a program to develop and build ramjet engines to power several types of Navy guided missiles. Along with stepped-up development and production of jet engines, Pratt & Whitney continued production of R-4360 Wasp Major, R-2800 Double Wasp, and the R-2000 Twin Wasp piston engines for military and commercial users.

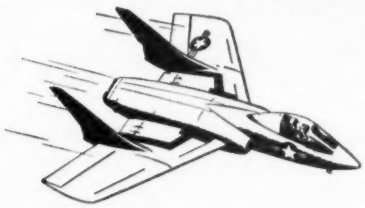
NEW PRODUCTS ADDED BY HAMILTON STANDARD

With twice as much manufacturing space as it had in East Hartford, Hamilton Standard division was able to put added emphasis on its aircraft equipment products and maintain its leading position in the propeller field. Production of a new type hydraulic pump and jet engine starters was begun; output of fuel controls and air-cycle refrigeration units increased. Development of the advanced Turbo-Hydromatic propeller with hollow steel blades continued during the year.

Hamilton Standard's reversing Hydromatic continued to dominate the commercial propeller field. Approximately 30 airlines throughout the world specified these propellers for new aircraft purchased during the year. These planes included Douglas DC-6As and DC-6Bs, Martin 404s, Convair 340s, and France's Breguet 763s. Almost all Lockheed 1049 Constellations and Super Constellations ordered by the airlines during the year will be equipped with 43E60 Hydromatic propellers. This propeller was also selected for 58 Douglas DC-7s ordered by four United States flag airlines. The military services continued to call on Hamilton Standard for propellers in high quantity for a large number of aircraft.

CUTLASS IN PRODUCTION AS CORSAIR OUTPUT ENDS

Chance Vought Aircraft's new Cutlass, the twin-jet F7U-3, passed pre-carrier tests, then went on to pass the initial phases of rugged carrier qualification on the USS Midway. Navy officials recently described the F7U-3 as "better than the Russian Mig." The Cutlass is in the over 650 mile-per-hour class and offers superiority in performance at high altitudes, in range, rate of climb, maneuverability and fire-power.



While the Cutlass emerged as one of this country's potential top weapons, Chance Vought brought to a close production of the famed Corsair of World War II. Two versions of the gull-winged veteran, the AU-1 for the Navy, and the F4U-7 for the French government under the Mutual Defense Assistance Program, were the last of the famous type to be built. The Corsair, powered by Pratt & Whitney R-2800 engines and equipped with Hamilton Standard propellers, is still in regular service in Korea.

SIKORSKY HELICOPTERS HAVE RECORD YEAR

The Sikorsky Aircraft division, the leader in the helicopter field, continued high production in 1952 of the S-55 type, which was in daily use by the Air Force, Navy, Marines, Coast Guard, and several airlines. In August, two S-55s, operated by the Air Rescue Service of the Military Air Transport Service, completed the first transatlantic helicopter flight in history. In Korea, Sikorsky four-place S-51s and the larger S-55 types carried out thousands of rescues, many of them behind enemy lines. They have evacuated more than 10,000 wounded from the front lines and carried out many other combat missions.

Commercial applications of the versatile Sikorsky helicopters increased during the year, with big S-55s being used in a variety of jobs throughout the world.

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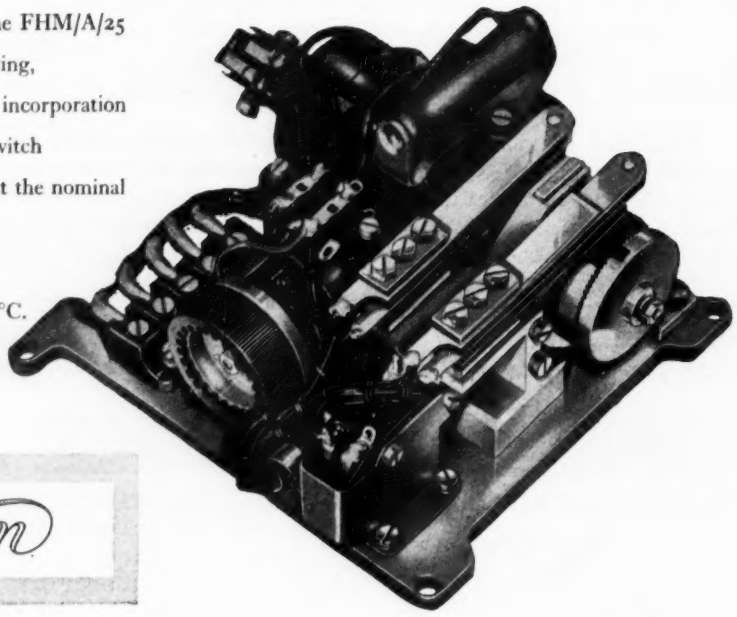

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Founded 1909

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Time for the Next Step

WHEN, in the summer and autumn of 1941, this journal published articles on the subject of the aircraft gas turbine and jet propulsion, the majority of its readers knew as little about this new prime mover as they do today about the so-called atomic engine. Many of the non-technically-minded were naturally openly sceptical, and even some engineers and designers of standing were not only disinterested but actually ridiculed the predictions and enthusiasm of "that chap Whittle." Mainly through the foresight of our late editorial director, *Flight* alone of technical journals persevered and, within the limits of wartime conditions and security, continued to provide every scrap of available information on the subject. The articles printed gave rise to the book *Gas Turbines and Jet Propulsion for Aircraft*, by G. Geoffrey Smith, which has been translated into several foreign languages and of which a sixth edition is now in preparation.

To say that progress has been remarkable in the 12 years since the Whittle-powered Gloster jet aircraft first flew is both a platitude and an understatement. As a nation we are more concerned today with the question of how best to exploit the lead we have established in the design and construction of aircraft gas turbines.

A lesson to be learned is the immense importance of good timing and courageous forward planning. Air Commodore Banks put that thought into telling words in a lecture on engine development (summarized on pages 479-481) which he gave in America recently. In his concluding sentences he said: ". . . remember that failure to take the next step to order a new engine may mean 10 years in the wilderness."

With the comforting knowledge that a very creditable start has been made in the aircraft gas turbine field, but bearing in mind the dangers of complacency and an overstretched national economy, some of our designers should now be turning serious thoughts to the atomic power unit for aircraft. Such things are far ahead—but not much farther ahead, perhaps, than the 10,000 lb-plus turbojet with a specific consumption of 0.8 was in 1941.

As far back as December 21st, 1951, and March 21st, 1952, we published lecture reports on some of the practical problems of applying nuclear power to aircraft, and it may have escaped the attention of some of those who set the pace in the British aircraft industry that in America orders have actually been placed for the design and construction of two different nuclear engines and the airframes to take them. One is to be a Pratt and Whitney and Boeing joint effort—two huge concerns with fine records and reputations to live up to; the other is a Convair/General Electric responsibility—two more great companies to which the same remarks apply equally well.

In connection with this association of companies it is perhaps significant that the recent share deal which brought a controlling block of Consolidated-Vultee stock to the General Dynamics Corporation means, firstly, that there will be a very close link between Convair and Canadair, Ltd., which have the same parent company and, secondly, that the Electric Boat Company, another and totally owned subsidiary, will also be closely related. (Reference is made to the Convair deal on page 476.) As the Electric Boat Company holds a contract for a nuclear marine power-plant the formation of an atomic-engine group is implied. It can be assumed that a pooling of knowledge and experience will follow and that a certain amount of joint development work will be possible, even though the eventual products for aircraft and ships will be very different.

This formidable group, backed by its Government contracts, should be able to provide the enormous resources needed to develop such power plants for sea and air.

It may well be that British brains and energies are already being brought to bear on nuclear prime-movers for land, sea and air vehicles in addition to the known work on industrial plant; quite rightly, much of what goes on in atomic-energy establishments is kept secret. But preoccupation with the many other problems and promising developments must not lead us to overlook or delay preparation for the next step—one which has already been taken in America.

"FLIGHT" Photographs

Two world-beaters: Viscount and Comet at Ciampino, Rome. Comet G-ALYW, outward bound for Singapore, completes the first stage of its journey while Viscount G-AMOG is refuelled for a final proving flight from London to Cyprus via Athens.

THE VISCOUNT ENTERS SERVICE

Turboprop Travel on European Routes: A Typical Flight to Cyprus

APRIL 19th is an important date for all the major European airlines, for it marks the introduction of summer schedules on international routes. The frequency of services has never been greater, and in almost every case fares have been cut by at least 20 per cent to attract extra traffic. The present is thus a particularly appropriate time for B.E.A. to introduce its newest and most competitive aircraft—the Discovery-class Vickers-Armstrongs Viscount 701.

At the time of writing the Discovery Flight possessed four Viscounts, with a fifth and sixth due for early delivery. The opening of Viscount services is, of course, being matched to the rate of delivery. Proposed inaugural dates, routes and frequencies are as follows :—

Date	Route	Frequency
April 18th	London-Rome-Athens-Cyprus	Tues, Sat
April 19th	London-Rome-Athens-Istanbul	Mon, Wed, Thur, Fri, Sun
April 24th	London-Zurich	Daily
June 1st	London-Geneva	Daily
July 1st	London-Copenhagen-Stockholm	Daily
July 2nd	London-Zurich	Nightly

Past issues of *Flight* have contained details of the various development, training and proving flights carried out by Viscounts, and the history, technical features and commercial qualities of the aircraft were the subject of a recent special number (March 20th). Now, with the Viscount on the threshold of its working life as an inter-city airliner, the story is brought up to date with a preview of this advanced aeroplane in action on a major route. Travelling to Cyprus on the latest production Viscount, we were given an accurate impression of the features—speed, comfort and reliability—which are expected to have a very favourable effect on B.E.A.'s results and reputation during the coming months and years.

An early start is inevitable if the passenger is to reach Cyprus at a convenient hour, and in our case reporting time at Kensington Air Station was 6 a.m. on April 2nd. Anticipating British Summer Time, which takes effect on April 19th, we advanced watches by one hour—which would, in any case, have been necessary on arrival at Rome (the first stop). An hour later we were aboard G-AMOG *Robert Falcon Scott*, and at 8.12 a.m. (indicated) were leaving Runway 28L *en route* for Rome. Travelling companions included Lord Douglas of Kirtleside and Lady Douglas, a number of Members of Parliament, and several B.E.A. personnel.

The Viscount quickly reached the selected height of 21,500ft, far above the stratocumulus layer concealing most of the Channel and Northern France, and settled down to a steady cruising speed of 292 m.p.h. While Steward Jones and Stewardesses Taylor and Osborne prepared breakfast, we took stock of the new seating layout (G-AMOG is the first Viscount to have the 47-seat standard interior). Although there are now five seats instead of four in seven of the ten rows of Rumbold seats, seat-pitching has not been decreased, and there is ample leg-room for the lankiest passenger. Each row of seats lines up with its pair of windows. Aisle-width has, of course, been reduced (from 28in to 17½in), and the seating is not quite as generous as in the original four-abreast 40-seater, but there is not the slightest suggestion of discomfort. On the contrary, efficient use of available space is combined with a tasteful styling to give a definite impression of luxury. Only the faintest vibrations are sensed, and the noise-level is very low, but to describe the aircraft as silent would be misleading. Although G-AMOG and subsequent B.E.A. Viscounts have extra sound-proofing around the forward part of the cabin, some noise still finds its way into this area from the airscrews and power-plants. Farther back there is a swish of air which would obviously be present even in a sailplane. But so long as the Viscount is not over-sold by its operators, passengers will not be disappointed; perhaps we can sum up best by saying that on the return trip to Cyprus we spent nearly 17 hours airborne out of 36 and felt ready to take off immediately for another journey of equal length.

Novices to air-travel will probably take turboprops for granted,

"Robert Falcon Scott," which made the London-Cyprus flight reported above, is the first 47-seat Viscount to be delivered to B.E.A. Interior comfort is illustrated (left) by a general view of the cabin, showing the new five-abreast seating, and a close-up of a passenger lunching at 20,000ft.

but those accustomed to flying in earlier types used by European airlines will welcome the Viscount as an advance in passenger-comfort ranking with the enclosed cabin and, more recently, pressurization.

Occasional gaps in the cloud gave glimpses of jagged white-and-brown mountains as *Robert Falcon Scott* flew over the Savoy Alps, clearing Mont Blanc, the highest peak, by at least 6,000ft. Visibility had improved by 10.30 a.m., when we passed Genoa at a T.A.S. of 300 m.p.h., and the excellent view of the north-west coast of Italy and of Elba was a foretaste of scenic pleasures to come. After a quick but comfortable let-down we flew low over Urbe airfield and the western outskirts of Rome, magnificent in the golden April sunshine. We made a straight-in approach to Ciampino, touching down on the 7,250ft tarmac runway at 11.25 a.m. Esso's big red bowser drove up as we reached the apron.

About 20 minutes later there was an unusually loud "arrival" noise, and we emerged from the transit lounge to see Comet G-ALYW beginning an overshoot; its landing had apparently been balked by a DC-3. This Comet, which had left London about an hour after the Viscount, was operating Flight BA782 to Singapore. When calling at Rome the following day we saw three more Comets—two London-bound (from Singapore and Johannesburg respectively) and one taking-off on the first stage of the inaugural Tokyo service. In the terminal building at Ciampino is a movements board showing the day's arrivals and departures of B.O.A.C., B.E.A., S.A.A. and Qantas aircraft; the sum effect is most impressive. On the day of our return we noted references to 22 flights—by six Argonauts, three Comets, one Hermes, eight Vikings, one Dakota, two Constellations, and our Viscount.

A 15 m.p.h. tail-wind assisted our passage to Athens, giving a ground speed of 310 m.p.h. at 19,500ft This proved an excellent height for studying the Italian landscape and coastline as, in quick succession, the Viscount's wing revealed such historic spots as Anzio, Cassino, Naples, Capri, Vesuvius, and Salerno. And yet our progress seemed slow when, soon after crossing the "instep" of Italy, the Singapore-bound Comet overhauled us, its contrail leaving a white scar on the deep blue sky above. We reached Athens in about 2½ hours, after crossing the Ionian Sea and passing over the Gulf of Corinth between the mountainous land-masses of the Greek mainland and, to the south, Morea. The approach to Hellenikon, situated on the coast 8½ miles from the city centre, was made over the sparkling waters of the Saronic Gulf.

Guest Service

The right to operate between Athens and Cyprus is retained by Cyprus Airways, an associate of B.E.A. and B.O.A.C. Recent Elizabethan services on this sector have been operated on behalf of, and under charter to, Cyprus Airways, and the same arrangement will govern the new Viscount service (which is advertised as Flight CY 33). It was originally suggested that specially trained C.A. crews might take over Viscounts at interchange points; in the event, however, B.E.A. crews will carry on through to Nicosia, night-stop, and fly the return service back to London the next morning.

Take-off from Hellenikon was delayed by nearly half an hour while unsuccessful attempts were made to start the Dart turboprops from an insufficient power-supply. Finally another ground-starter was borrowed from T.W.A., and a port engine was soon running sweetly, providing sufficient energy to start the other units. At 5.26 p.m. (we had gained another hour at Athens), *Robert Falcon Scott* set off on the final leg of the 2,200-mile trip, turning over the ancient capital and setting out to sea before climbing to 19,500ft on course for Cyprus. The Ægean crossing, with its innumerable glimpses of islands small and large, was possibly the most impressive part of the entire journey. Even with the aid of the small-scale route-map issued by B.E.A. to their passengers it was possible to identify individual islands. Route-lines are marked at 50-mile intervals, so that the rate at which these pinpoints are left behind—about one in every 10 minutes—gives the Viscount passenger a very real idea of speed. Although printed in bright colours, the maps appeared almost pale by comparison with the sunny Mediterranean scenes which unfolded beneath the Viscount's large oval windows. By 7 p.m. we were flying in darkness over fairly dense cloud, permitting only a faint glimpse of Rhodes and the coast of Turkey. Within 40 minutes the gay lights of Nicosia were winking a cheerful greeting. Touch-down was delayed slightly—until 7.53 p.m.—by the need to make a practice beacon approach to the airport, which is used jointly by the R.A.F. and the airlines.

Robert Falcon Scott taxied to the small terminal area and was promptly boarded by an airport official carrying a disinfectant spray. Most of the occupants were sneezing as they disembarked. We were greeted by Mr. Platt and Capt. Pugh, commercial manager and chief pilot, respectively, of Cyprus Airways. The company operates six Dakotas, which are giving fine service on routes to Athens, Istanbul, the Persian Gulf, Beirut, Haifa, Tel Aviv, the Sudan and Cairo; a new route to Benghazi and Tripoli will shortly be opened. Capt. Pugh told us of good progress made in training seven of the airline's eight radio officers as pilots. All the students have now completed over 130 hr solo on the Auster (Cyprus Airways have two J5s, which are employed mainly on crop-spraying and photography) and Oxford. Their flying training, which has been carried out entirely from runways, has been supplemented by engine, airframe, Link and postal instruction.

Two Darts are pictured against a mountainous background as the Viscount climbs away from Hellenikon Airport, Athens, on the final leg of the journey to Cyprus. The Rolls-Royce turboprops ran perfectly throughout.

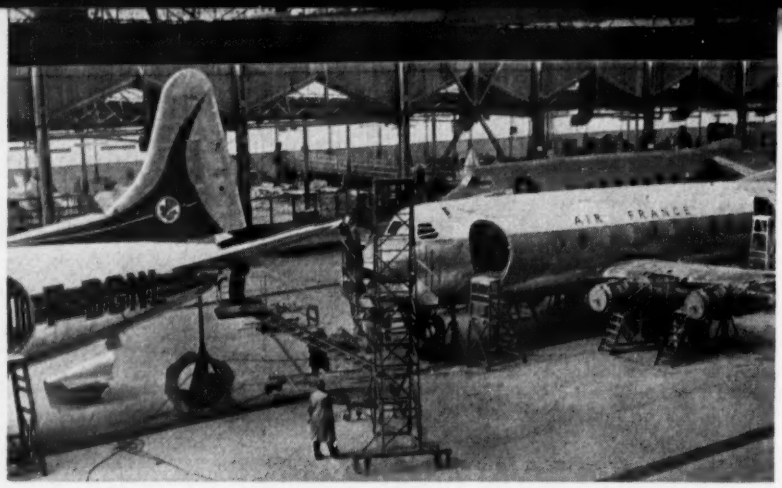
Take-off time for the return journey was 9.49 a.m. (local) on Good Friday. The importance of Nicosia as a traffic-centre was underlined by the amount of early-morning activity which enlivened the period of waiting to board the Viscount. The most colourful arrival, from Sharjah, was a Skymaster of Bharat Airways, which disgorged over 60 Indian emigrants to Jerusalem. Its bearded, turbaned skipper could be glimpsed through the left-hand cockpit window. Pilgrims emerged from a DC-3 of Sobelair. British independent interests were represented by a B.K.S. Dakota and an Eagle Aviation Viking, lately acquired from B.E.A. and still wearing the familiar red-and-white Corporation colours; between them stood a C-46 Commando of El Al (Israel Airlines). The R.A.F. section of the airport was even more crowded—with Vampire and Meteor squadrons, trainer and night-fighter Meteors, two Venoms, target-towing Beaufighters, two Varsities and the ubiquitous Anson; Exercise "Session" was in progress.

Starting was quickly effected with the aid of a Murex truck, lately imported by Dart-Dakota, and within a few minutes of take-off the Viscount had pierced an out-of-season cloud layer which covered most of Cyprus. Flt. Capt Johnson, together with a few passengers, remained on the island; otherwise our crew was unchanged: Flt. Capt. Baillie (B.E.A.'s chief pilot), Capt. Priest, R/Offs. Bristow and Coppin, and Engineer Warkham. The normal crew-complement of the Viscount is two pilots and a radio officer, and larger crews are carried only for training purposes.

Despite a 20-m.p.h. headwind, the return Cyprus-Athens leg was slightly faster than the outward trip; G-AMOG cruised at 300 m.p.h. T.A.S. at 20,500ft. Comparable head-winds were met for most of the remaining stretch, but they added less than 30 minutes to the total journey-time. Towering cu-nims faced the Viscount as it approached Paris and Capt. Baillie decided to avoid the bumps by climbing to 30,000ft. Although more power has been extracted for record flights and on some Dart-Dakota services, the Darts were operated throughout at 13,300 r.p.m., which is the present cruising limit for scheduled services. Cabin conditions were perfect at all times; perhaps the best compliment one can pay to the pressurization, heating and conditioning systems is to say that the passengers forgot the existence of such things. Visibility was good over London, and the occupants of G-AMOG were given a fine view of the brightly lit city before returning to Runway 28L at 6.53 p.m., seven minutes ahead of schedule.

The total great-circle distance covered in 16 hr 50 min flying was over 4,200 miles—and the actual air-mileage flown was obviously much greater, due to climbs and descents, air-traffic procedures and deviations caused by cloud or high ground. Approximate lengths of the three sectors flown between London and Cyprus are: London-Rome, 910 miles; Rome-Athens, 650 miles; Athens-Cyprus, 560 miles. In round figures, the corresponding block speeds (take-off to touch-down) achieved by the Viscount on this typical flight were, respectively, 270 m.p.h., 250 m.p.h. and 240 m.p.h. Essential to the attainment of such block speeds under everyday conditions on medium stages in Europe is the ability to cruise at a genuine 290-300 m.p.h.—an ability which is not found in other airliners used in Europe today. Timetables bear witness to the Viscount's rapidity, but the standard of passenger-comfort must be sampled to be appreciated. R. B.

FROM ALL QUARTERS



AIR FRANCE VISCOUNTS on the final assembly line at Weybridge. The second of the batch of 12 is fast approaching completion (left), the Darts have already been installed in the third, while the fuselage of the fourth (F-BGNM) is visible in the background.

The Mig-15 bis

FURTHER information concerning the March 5th flight to Bornholm Island of a Mig-15 bis of the Polish Air Force was given by the pilot, 2nd Lt. F. E. Jarecki, at a meeting in London last Monday, when he was awarded the Polish Silver Order of Merit.

The flight to Bornholm, he claimed, had been made at a speed of 683 m.p.h. After making a circuit of the Roenne airfield at 1,300ft at about 470 m.p.h. he brought the aircraft in low, narrowly missing the barbed wire boundary-fence, and came to a stop at the far end of the small grass strip.

Giving details of the equipment of the Polish Air Force, 2nd Lt. Jarecki stated that he himself had been trained on Ut-2, Yak-9, Yak-11 and Mig-15 machines in turn. The early Mig-15s in Polish service, powered by RD-45F turbojets, had a top speed of 665 m.p.h., while the Mig-15 bis—as used for the flight to Bornholm—with WK-1 turbojet of 5,950 lb thrust, could achieve 685 to 745 m.p.h. The endurance of the machine, fitted with drop tanks, he estimated at 2 hours at a height of 49,000ft. The all-up weight was 11,085 lb, and the armament consisted of two 23 mm guns and one 37 mm gun

Also in use with the Polish Air Force, he continued, were Il-28 jet bombers, and a number of Russian officers were in charge of various units of the service. Approximately 120 jet aircraft were in use, and the total operational strength was 300. He believed that the Russians had some 200 aircraft—all jets—in service in the Pomeranian and Silesian areas of Western Poland.

Perhaps the most significant remark made by 2nd Lt. Jarecki, in reply to a question by *Flight's* representative, was that "the Mig has not yet flown at supersonic speed."

A Convair-Canadair Link-up

AN important deal has been announced whereby General Dynamics Corporation—the American parent company of Canadair, Ltd.—will acquire from the Atlas Corporation 400,000 shares of its holdings in Consolidated Vultee Aircraft Corporation. This will constitute the largest block of Convair shares in the hands of one holder, and General Dynamics are acquiring it for $8,700,000 cash and 20,000 shares of their own common stock.

It is expected that Mr. John Jay Hopkins will become chairman of the board of Convair in addition to his present position as chairman and president of General Dynamics.

Announcing the deal on behalf of Atlas Corporation, of which he is president, Mr. Floyd B. Odlum stated: "We entered the Convair picture at a time when the company was beset by financial and business difficulties. We have brought it through to the point where its organization is sound, its finance in excellent shape, and its future seems bright. It is logical that Atlas Corporation, in line with its policy of investing in special situations, should at this stage withdraw from the position of sponsorship. The new relationship between two companies—the one developing the atomic-powered submarine, and the other the atomic-powered airplane—will make for strength in both, as well as in our national defence picture."

Speaking for General Dynamics, Mr. Hopkins emphasized that the transaction would not interrupt the continuity of policy and management at Convair; General Joseph T. McNarney would continue as president of the company.

General Dynamics Corporation have been the parent company of Canadair, Ltd., of Montreal, since 1947. Canadair are, of course, well known as constructors of North Star transports (B.O.A.C.'s Argonauts), and, under licence, North American F-86E Sabres and Lockheed T-33 trainers. They are at present preparing for the production of the Beechcraft transport/crew-trainer for the U.S.A.F. An important future venture, recently rumoured, is the manufacture for the Canadian Government of a maritime-reconnaissance version of the Bristol Britannia.

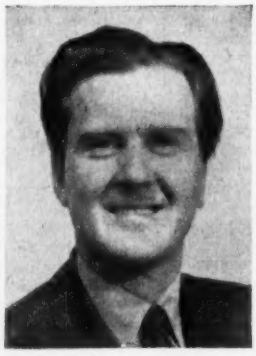
Convair, with aircraft plants at San Diego and Fort Worth and with a guided-missile plant at Pomona, are one of the largest United States aircraft manufacturers. They are best known, perhaps, for their widely used Convair-Liner civil transport (and its military derivative, the T-29 navigator/bombardier trainer); the vast B-36 intercontinental bomber; the turboprop-powered XP5Y-1 long-range patrol flying-boat; and the XF2Y-1 Sea Dart water-based fighter. They also have several advanced designs of aircraft and missiles in various stages of development.

Two Missing Pilots

AT the time of going to press there is still no news of two well-known sporting pilots, missing on solo flights—Rodney Matthews-Naper and Tom Hayhow.

For Matthews-Naper, in fact, hope was abandoned on April 4th, and a widespread search called off. He had taken off from Northolt at 6.40 p.m. in his Miles Messenger, G-AKBL, on April 1st, to fly to Dublin, which he contacted by R/T. at 9.50; nothing more was heard. Unconfirmed reports said that he was carrying one or more passengers. A search of the Irish Sea by ships and aircraft was instituted, and climbers searched the Mourne Mountains in Co. Wicklow, but all to no avail. Thirty-five years of age, and a farmer by occupation, with an estate at Loughcrew, Oldcastle, Co. Meath, he made considerable use of his Messenger for both business and recreation. He entered for several of the National Air Races during the past few years, and last year he organized a private owners' air rally in Eire. He was born in Australia, and during the war he served in the Royal Australian Navy; he was said to be planning a return there, in his Messenger, at the time of his disappearance.

Tom Hayhow was seeking to add more capital-to-capital records to the 28 he already holds. Flying his Auster Aiglet trainer G-AMOS, he was aiming at Belgrade, a 1,053-mile flight. He was timed out of Denham by R.Ae.C. observers at 6.05 a.m. on Friday last, April 10th, heading for Munich (530 miles) which he reached at 11.29 G.M.T. Refuelling with enough petrol (60 gallons, carried in the standard and extra tanks) for over seven hours' flying, he took off at 12.8, intending to reach Zemun, Belgrade's airport, by flying a track passing over St. Ilz and Ivanic Grad. Thereafter nothing more was seen or heard of the Auster, although it carried radio.



R. Matthews-Naper.

T. W. Hayhow.

Air-traffic control centres in the areas between Munich and Belgrade made numerous enquiries, and air and ground searches were laid on by Service units in the Unites States zone of Germany, by the Italian and Yugoslavian authorities, and by civil flying organizations.

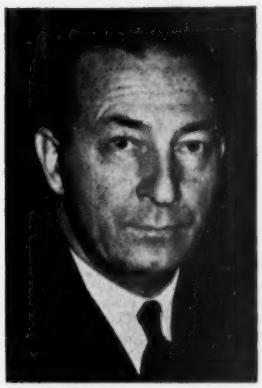
The first of several slender clues was a report from a meteorological station on the 7,000ft Dobratsch mountain, in Carinthia,

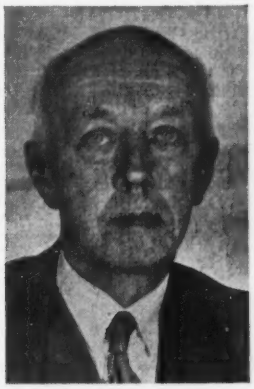
which reported hearing an aircraft circling the district in thick weather on Friday afternoon. Continuing bad weather, however, hampered the search on Saturday. Later, there was a report that an aircraft had flown low over Arnoldstein, on the Austo-Italian frontier, and ski patrols set out to search the neighbouring peaks. On Sunday the search was centred on the Dobratsch mountain area, where shepherds had also spoken of having heard an aircraft on Friday; new snow hampered ground operations, but a number of search-sorties were flown by Yugoslavian aircraft. G/C. D. A. Garner, British Air Attaché in Belgrade, flew to Vienna on Sunday to co-ordinate the search.

In view of the low night-temperatures in the mountains, local authorities were pessimistic as to the lost pilot's chances.

Three Handley Page Appointments

IT was announced last week that Mr. G. C. D. Russell, A.F.R.Ae.S., has been appointed assistant managing director of Handley Page, Ltd., and of its subsidiary, Handley Page (Reading), Ltd. Mr. Russell joined the parent company in 1919





Above, left and right, Mr. G. C. D. Russell and Mr. G. R. Volkert; right, Mr. J. H. S. Green.

as an engineering apprentice. In later years he has held a number of technical and administrative posts and, during the war, was personal assistant to Sir Frederick Handley Page. Afterwards, he became secretary of the company.

Mr. G. R. Volkert, C.B.E., F.R.Ae.S., has been appointed technical director of the Reading company. His association with Handley Page began in 1912 when, at the age of only 21, he took charge of the design department. He went to Japan in 1921 as a member of the British Aviation Mission and, on his return in 1923, became chief designer to the company. Retiring after the war, he nevertheless continued his association as a design consultant.

Mr. J. H. S. Green, A.C.A., has been appointed secretary and chief accountant of both companies. He joined Handley Page early in 1951 as assistant accountant, and has been chief accountant since March, 1952.

The Berlin Air-corridor Discussions

FROM German press reports of the four-power talks on air safety in the Berlin air corridors, it appears that immediate agreement on the Russian proposals is unlikely. At the suggestion of Lt-Gen. J. T. Podgorny (leader of the Russian delegation) the scope of the original Anglo-Russian talks had been widened to include France and the U.S.A., and the four-power discussions began on Tuesday, April 7th.

The Russian proposals, made at the meeting at Karlshorst on April 8th, are stated to involve the substitution of the existing three corridors, each of 20 miles' width, by one 60-mile corridor between Berlin and Hanover. The three corridors now in use join Berlin with Hamburg, Hanover, and Frankfurt respectively. Further proposals demand that the use of the air corridor by armed military aircraft be strictly prohibited; that all aircraft using the corridor fly between 1,000 and 4,000ft (instead of below the present maximum altitude of 6,000ft); and that longer advance warning be given, through the Air Safety Centre, of flights.

It is thought that the proposed changes are so drastic that prolonged consultation by the three Western Powers will be necessary. The new scheme has obvious disadvantages for aircraft approaching Berlin from either Hamburg or Frankfurt, and the proposed reduction in the altitude ceiling would be dangerous, especially as all aircraft would be concentrated on the one route. The widening of the corridor seems unlikely to provide any effective compensation. The prohibition of corridor-flights by armed military aircraft has in fact been an unwritten rule for some time, and no such aircraft has been flown by the Western Allies to Berlin; but the imposition of a definite prohibition for the future may well be unacceptable.

SERVICE AND CIVIL: As reported on page 496, the crews of the R.C.A.F. Comets are making familiarization flights, using the B.O.A.C. South African route. One of the pilots, S/L. J. B. Dickson, is seen with Capt. E. E. Rodley, who supervised the first flight. On the trip, Capt. Rodley became the first airline pilot to complete 1,000 hours on Comets; on reaching Rome, he received a message of congratulation from Mr. John Profumo, Parliamentary Secretary to the M.C.A.

New Met. Office Chief

THE Secretary of State for Air has approved the appointment of Professor O. G. Sutton, C.B.E., D.Sc., F.R.S., J.P., to succeed Sir Nelson K. Johnson, K.C.B., D.Sc., A.R.C.S., as Director of the Meteorological Office on the latter's retirement next autumn. Prof. Sutton is at present Bashforth Professor of Mathematical Physics at the Royal Military College of Science, Shrivenham.

Dr. Sutton, who was born in 1903 and educated at the University College of Wales, Aberystwyth, and Jesus College, Oxford, began his career in the Government Scientific Service at the Meteorological Office in 1928.

In recent years much of his time has been spent in armament research. In 1941 he was placed in charge of research in chemical defence, and in 1943 he became Superintendent of Tank and Armament Research. Towards the end of the war he was appointed Chief Superintendent of the Radar Research and Development Establishment at Malvern, in succession to Sir John Cockroft. This post he held until 1947, when he went to Shrivenham. He was Scientific Adviser to the Army Council in 1951.

Dr. Sutton is one of the Royal Society's representatives on the Meteorological Committee, and is chairman of one of the sub-committees of the Meteorological Research Committee.

N.Z. Race Control-point Eliminated

LAST week-end the Royal Aero Club announced an amendment to the rules for the England to New Zealand Race. Giving details, the Club said that, in view of representations made by accepted entrants in both sections of the race, further consideration had been given by the records, racing and competitions committee to the possibility of dispensing with the intermediate control point in the general region of Basra.

"It has always been realized" (continues the statement) "that the elimination of any specific intermediate control point would not only simplify control of the race, but would give competitors greater freedom in their staging over the route and in making their arrangements for refuelling. Now that the full entry list is known the committee takes the view that it is feasible to dispense with the control point on the understanding that competitors will be required to produce evidence that they have taken a south-easterly course between England and New Zealand."

Race condition No. 1.6 has been amended accordingly. To provide the required evidence, competitors must have their race log-books officially stamped by the appropriate aerodrome authorities at any one refuelling stop between longitudes 30 deg east and 120 deg east along the route.

HERE AND THERE

PENGUIN: Mr. Douglas Bianchi at White Waltham with the ground trainer referred to below ("Getting the Feel of It"). Flying controls operate in the orthodox way, but the whole of each wing acts as an aileron. The machine pivots laterally about its undercarriage mounting.

Australian Appearances

THE first of an initial batch of 40 Canberras to be built in Australia has been completed at the Government aircraft factory and will soon be test-flown by Mr. John Miles, the chief test pilot. The first Sabre built by the Commonwealth Aircraft Corporation will also be tested shortly. The Corporation has 72 on order, powered by Rolls-Royce Avons also built under licence by Commonwealth Corporation.

World Speed Record Amended

ACCORDING to news in *National Aeronautics and Flight Plan*, the official organ of the National Aeronautic Association, the figure for the world speed record gained by an F-86D (Capt. J. Slade Nash) last November has now undergone slight alteration. It is stated that examination of the timing photographs has disclosed errors in computation, and that the speed should be 698.5 m.p.h. instead of the 699.92 originally announced. It is added that the new figure has been accepted by the F.A.I.—and that "the Air Force is setting about taking another crack at the record, using either an F-86H or a Republic F-84F, while the Navy is reported considering a try with the Douglas F4D."

Getting the Feel of It

ILLUSTRATED on this page is an ingenious ground trainer developed by Mr. Douglas Bianchi, chief engineer of the West London Flying Club, who before the war was associated with the late Robert Kronfeld in the building of a somewhat similar type of machine. Of exceptionally sturdy construction—the fuselage is a metal torsion-box—the trainer pivots laterally about its upper undercarriage-mounting (the horizontal member visible behind the pilot's back) as soon as the tail is clear of the ground. The pupil starts his instruction with the pivot locked. Believing that machines of this kind would be useful for A.T.C. and similar organizations, Mr Bianchi hopes to build half a dozen if suitable engines can be found; the unit in the prototype is a 28 h.p. Douglas Sprite.

Take Your—

"SO far as the 1950s are concerned, the British are the sole masters of the future mode of commercial flying, and whatever the future outcome, they are back in the industry to stay."—*Fortune*, the influential American journal of industry.

—Choice

". . . The British will not capture the world market and there is considerable question whether they weren't rushing this fast new medium before its time. . . . The bulk of jet aircraft will be built on the west coast of the United States. . . ."—Wayne Parrish, editor of *American Aviation*.

Nan Zebra and Oboe George

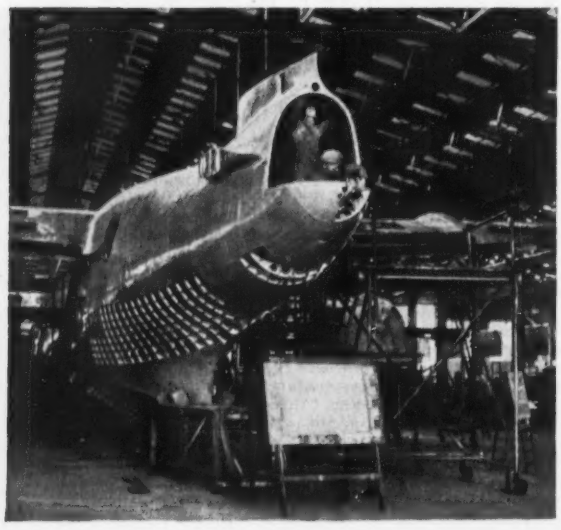
THE registration G-AMNZ, originally allocated to the seventh Viscount to be built (and accordingly the fourth to be delivered to B.E.A.), has now been reserved for Viscount No. 20. This machine, not yet completed, is expected to be B.E.A.'s entry in the New Zealand race, and it will thus carry a most appropriate registration. As reported on page 474, *Robert Falcon Scott*, the original "NZ," has now been re-registered as G-AMOG. All B.E.A.'s *Discovery*-class Viscounts are named after explorers; the name *James Cook*, which obviously pairs well with G-AMNZ, has been transferred to it from G-AMOK, which in turn will now become *Sir Humphrey Gilbert*.

On the Spot

WHEN the whale-factory ship *Norhval* reached Cape Town recently she reported that the helicopter which she carried had proved most valuable: on one occasion its pilot spotted a school of 200 whales.

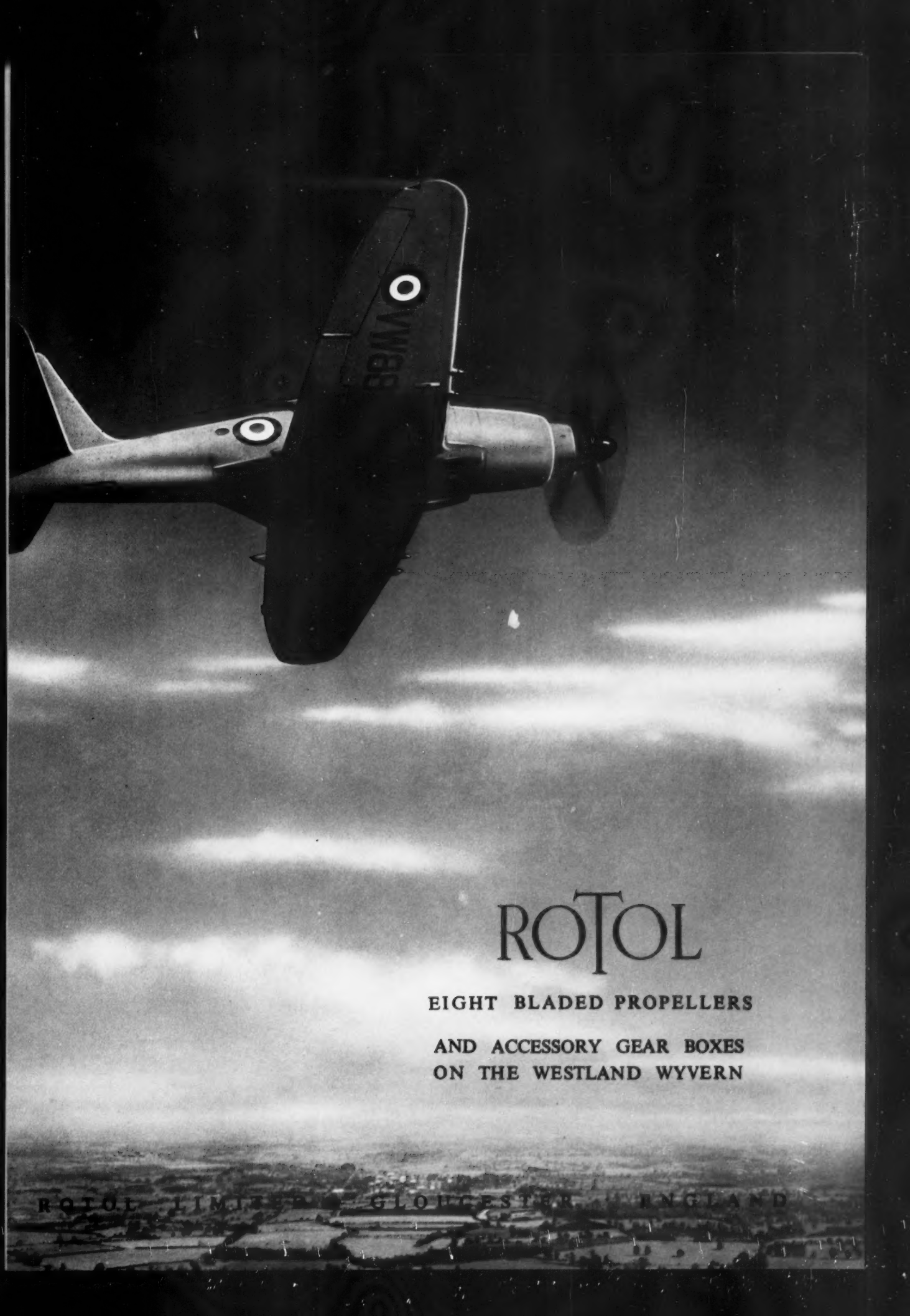
For the Record

AN amendment must be added to our preliminary review, published on April 3rd, of the results of the R.Ae.C. Design Competition. It was suggested that the Somers-Kendall SK-1 design specified fuselage-installation of the fuel tank, whereas provision is in fact made for wing tanks. The judges' comments on this entry included the remark that "the design of the fuel tanks appears to be very satisfactory." The SK-1 design gained third prize in the racing-aircraft section.



SKINNING A SUNDERLAND: One of 16 Sunderlands, for the Royal New Zealand Air Force, now being prepared at the new Queen's Island works of Short Brothers and Harland, Ltd. The new building, of 130,000 sq ft area, augments the already extensive production facilities at Belfast; it is also being used for the erection of Series 2 Comets—for which, incidentally, the runway at Sydenham airport is in process of being lengthened to over 2,000 yd.

SWIFTLY FROM JAPAN: The "first-flight cover" on the right came to London by the first Comet return service from Japan on April 5th-6th. The journey took 38 hr 50 min.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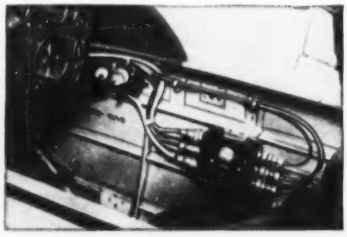
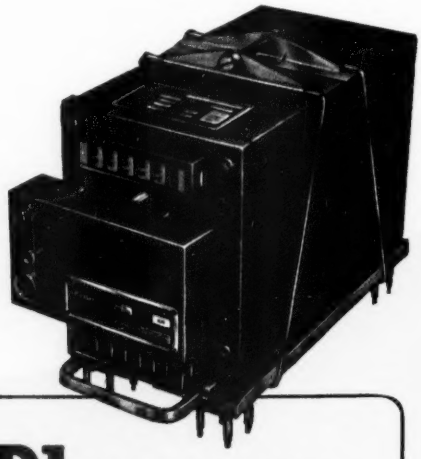
Type PTR 61

The PTR 61 provides VHF R/T communication on six crystal-controlled channels in the 116-132 Mc/s band. The expected range of 50 miles at 3,000 ft. is often exceeded in practice. Three alternative forms of control — simultaneously tuning receiver and transmitter — can be provided at remote or local positions.

- *Power consumption approximately 55W.*
- *All-up weight including cables 17 lb. (24 lb. with remote control).*
- *Crystals and channel frequencies can be changed in flight.*
- *Intercommunication facilities at up to three positions*
- *Fully tropicalised.*



Part of dual installation for instructor and pupil on D. H. "Chipmunk."



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Engine Procurement and Development

A Revealing Paper by A. Cdre. F. R. Banks before the I.Ae.S.

RECENTLY we referred briefly to an address by Air Commodore F. R. Banks, C.B., O.B.E., F.R.Ae.S., principal director of Engine Research and Development, Ministry of Supply, before the Institute of the Aeronautical Sciences in Cleveland, U.S.A. We have now received a copy of the full text, a summary of which follows. The importance of this lecture and the wealth of information it contains could certainly not be judged from the few garbled extracts originally received from American sources. The subject was *British Practice in Aviation Engine Procurement and Development*.

"The essence of any satisfactory procedure is the speed and simplicity by which it can be implemented, and this in turn will depend upon the degree of mutual trust there is between the industry and the Government department concerned." Thus A. Cdre. Banks introduced his paper. The British methods of initiating and progressing an engine contract were the most satisfactory he had yet encountered for rapid action and comparative freedom from official bumbledom and paper work—giving the engine manufacturer full scope to go ahead and to do the best he knew in evolving a new engine.

There was no formal method of determining a requirement for a new engine. The need might stem from a specific aircraft project resulting from an Air Staff "operational requirement" for which existing engines were unsuitable. It might originate within the M.o.S. or from an engine manufacturer ahead of a specific requirement. Or, again, it might come as a result of discussions between an engine and aircraft constructor whose new project it was mutually hoped might be of such merit as to warrant an Air Staff requirement being written around it.

A new development was referred to by the lecturer whereby an attempt had been made to assess more accurately the right size and type of engine to build in anticipation of a future aircraft requirement. Meetings had been held with the aircraft designers of both fighters and bombers (in two separate groups), and, as a result of consideration of hypothetical but probable aircraft requirements, it had been possible to get some idea of the envelope or parameter of maximum power and performance required and whether this power should be vested in one or two engines for the fighter, or more than four for the bomber. Visits to, and discussions with, engine firms followed, and some interesting results were now being studied.

Assuming that the gestation period for a new engine was from four to five years from the commencement of design to the type-test stage, A. Cdre. Banks pointed out that this period was rarely sufficient to get the engine ready for the prototype aircraft. Since the turbojet and its aircraft were so interdependent, to meet the design performance (and it was not possible to consider one without the other) an engine which was already available was a safer bet. The Nene (J 42) could be instanced as a turbojet built in advance of a specific aircraft requirement; no aircraft became available for it until the Hawker N.7 was designed. The Avon, Ghost and Sapphire were not ordered against any specific aircraft requirement.

The early idea that the gas turbine could be tailored for each aircraft requirement had not been realized in practice. Since the axial-compressor type of engine had come into its own and was so prodigal of man-hours in manufacture, it would be most expensive to build a plurality of different engines to suit every new type of aircraft.

The M.o.S. procedure for engine procurement could be summarized as follows:—

(1) If the idea for an engine originated from M.o.S. it was discussed with a number of engine firms, especially those having most experience of the particular engine type. If, however, the project came from one firm, then discussions were held with that firm alone.

(2) When ideas had been sufficiently crystallized to produce a general-arrangement drawing and design brochure, the National Gas Turbine Establishment (N.G.T.E.) might be brought in for a technical assessment of the design (this was an aero- and thermo-dynamic assessment but, sometimes, comment was also requested upon the mechanical design). The M.o.S. and R.A.E. aircraft projects sections would also be asked for an appreciation of its performance suitability for a foreseeable aircraft requirement.

(3) There was no fixed rule that a firm aircraft requirement was necessary before an engine could be ordered. Conversely, some aircraft projects of radical or unconventional design might demand entirely new or considerably modified engines, which must then be ordered in parallel with the prototype aircraft.

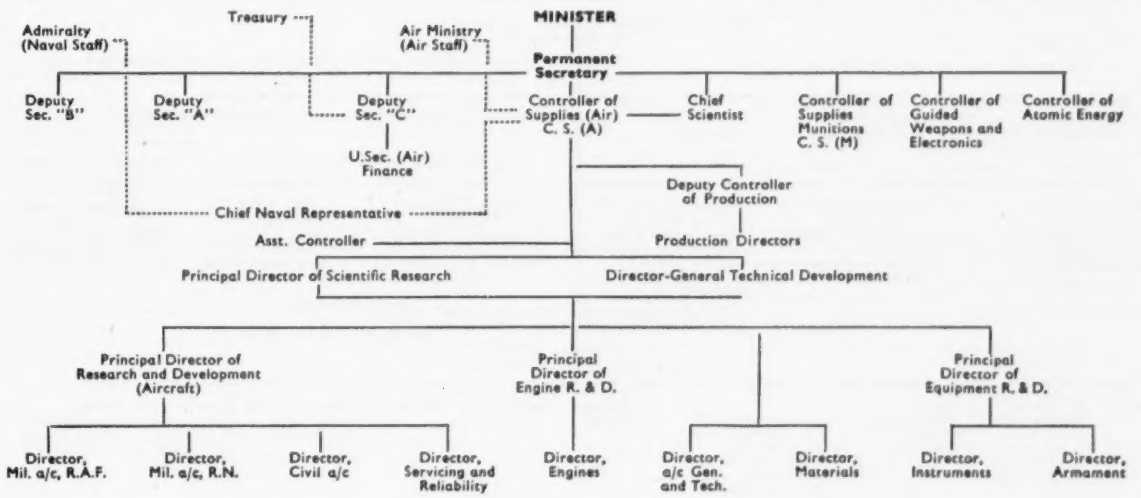
(4) The Principal Director of Engine Research and Development (P.D.Eng.R.D.) [the post now occupied by the lecturer.—Ed.], having satisfied himself that a particular engine should be ordered, would decide which of the firms submitting brochures should be given the contract, assuming the project was not the idea of any one firm. He would take into account the engine type and determine the firm or firms most capable of executing the final design and bringing the development of the engine to fruition. Often, a contract would be awarded to more than one engine firm—particularly if the requirement and conditions were sufficiently unusual or novel to warrant some insurance and spreading of the technical risk. Consideration would also be given to the pressure of work at each firm and the overall loading of the industry.

(5) Having made his decision, P.D.Eng R.D. would submit a formal request for the engine to the Controller of Supplies (Air) [C.S.(A)], through the Director-General of Technical Development (Air) [D.G.T.D.(A)] and, in some cases, the Principal Director of Scientific Research (Air) [P.D.S.R.(A)]. Upon agreement being received, a requisition was submitted to the finance (Air 2) and contract branches for financial approval and contract action to order a number of development engines. Since the war, six engines had usually been ordered, but this number might be increased as development proceeded and particularly when the experimental flight stage was foreseen.

(6) Treasury approval must be sought before the finance branch cleared the requisition. This applied to a completely new engine type rather than to another mark of an existing engine, the expenditure for which could usually be approved directly by the finance branch within the Ministry.

Contract Procedure.—A. Cdre. Banks then went on to discuss the contractual procedure, which might take from one to three months from the time of agreement to order. This did not normally delay or restrict the engine manufacturer, and if absolutely necessary an instruction to proceed (I.T.P.) could be issued pending completion of the contract. The Ministry did not pay separately for the design of an engine, the cost being included in the engine supply contract. This usually confirmed the manufacturer's tender and price for designing the engine and building a number of prototypes.

Fig. 1. Situation of the Directorate of Engine Research and Development in relation to other M.o.S. departments concerned with aircraft procurement.



Engine Procurement and Development . . .

It was usual to estimate spare engines on the basis of 50 per cent of the number of engines fitted in an aircraft. It was unlikely that a manufacturer would machine more than two or three complete sets of engine parts at the outset, leaving the remainder in the form of rough forgings and castings, since a radical change and redesign might become necessary as a result of failure in the early development phase.

The contract price and conditions for the first engines made provision for an acceptance-test at powers to be decided later. In practice the conditions of the acceptance-test were very flexible and were dictated by past experience and the knowledge of the engine submitted. In practice the test was regarded as practical proof of completion of the initial prototype engine and that it was capable of running. Each and every prototype engine had to pass an acceptance-test, the severity of which was increased progressively according to the state of development and the behaviour of the engine previously built, until a firm rating had been established for the type. Engines accepted subsequently had then to pass a two-hour test based on this rating. The object was to achieve a better standard for each subsequent engine.

After the acceptance-test, and stripping and inspection by the Ministry and the firm, bench running began on another contract calling for *x* hours of experimental running at a cost of £*y* per hr. If a radical redesign for, say, an increased performance requirement was called for, still another contract would be issued to cover this revision.

Flight- and Type-Tests.—A. Cdre. Banks then turned to flight-clearance and type-tests. For special-category or flight-clearance to permit experimental flying to begin, a test of 25 hours' duration was normally made, but a longer period might be specified, depending upon the state of development of the engine.

There was at present in draft form—awaiting approval—a flight-test schedule the object of which was to regularize and standardize flight-testing procedure. To date, this procedure had been left rather in the hands of the individual engine builder.

Finally there came the type- or model-test of 150 hours' duration; the engine manufacturer tried to complete this test as soon as he was satisfied that the performance and mechanical standard of the engine justified an attempt. The official type-test was usually preceded by a number of 150-hour tests run to type-test conditions. British official engine tests were done at the plants of the manufacturers, not at Government establishments, but were under Ministry supervision. It was considered that our type-test conditions permitted very close matching with actual engine conditions in flight.

A. Cdre. Banks then turned to the next phase of development, the completion of the type-test having normally permitted the sealing of the Drawing Introduction Sheet (D.I.S.), which was a list of approved drawings for the engine type or model. Production could then proceed. If urgently required, permission could be given to release material and tooling in advance of the type-test, and separate sections of the D.I.S. might be approved and sealed in advance to enable machining of components to commence. An I.T.P. could also be issued for speeding production preparations. Until the D.I.S. was sealed, design changes were largely the firm's concern, but afterwards any further design changes required the prior agreement of the Engine Modifications Committee (E.M.C.) at the M.o.S.

At the firm there was also a Local Modifications Committee (L.M.C.) operating under the chairmanship of the Resident Technical Officer. The members of this committee were drawn from the firm, the R.T.O. staff and A.I.D. The R.A.F. and the Navy were represented on the main E.M.C. Committee. All these proceedings were extremely flexible, and in cases of special urgency could be expedited—for example, by telephone agreement between local R.T.O. and chief R.T.O., the paper work being put in order at the next meeting.

Performance Acceptance.—British procedure for the performance acceptance of production engines was then described by the lecturer as follows: First, the brochure performance was vetted by the Ministry; if it was accepted as the performance likely to be achieved, the type-test conditions for the engine were then based upon a combination of r.p.m. and jet-pipe temperature calculated to give as nearly as possible the brochure power. Production engines were expected to meet this performance but were allowed a low limit of 4 per cent below type-test power to pass, provided the jet-pipe temperature was within the permissible limits. As the Air Commodore understood it, U.S. practice was to declare the nominal maximum engine rating as the minimum acceptable for clearing production engines.

There was little to choose between the two procedures, but at present we favoured our own method. An attempt was always made to obtain from type-test results a nominal rating which should represent the average production engine; and it had also been found, in practice, that the average negative tolerance on production test was nearer 2 than 4 per cent. There was little advantage, and sometimes considerable disadvantage, in erring on the high side of jet-engine performance in production, because of the effect it might have upon fuel consumption and range. In the case of multi-engine aircraft, it was important that the average hourly fuel consumption should not be substantially different from the nominal figures supplied to the aircraft designer. For the single-engine fighter, a wide variation in thrust or fuel consumption between production engines could also be embarrassing.

A reduction in the negative allowance, from 4 to 2 per cent while still retaining the present nominal average rating, might soon be agreed. In this connection, we had successfully tried, in certain cases, the U.S. method of adjusting propelling-nozzle areas by means of trimmers or "mice."

Another allowance was also made in the type-test, to meet engine behaviour at altitude. At present, British engines employed a method of control in which the fuel supply was regulated by throttle setting and ram pressure, with a top limit controlled by a maximum-speed (r.p.m.) governor but without any link-up with jet-pipe temperature. Since j.p.t. often tended to increase with altitude, it was necessary to set the limiting temperature, for acceptance of the engine, at 20 to 30 deg C (36-54 deg F) below the operating limit fixed by the type-test, in order to meet this temperature increase; but the minimum acceptable thrust must remain within the 4 per cent drop allowed for production engines.

Automatic j.p.t. control was now being developed and would be introduced on all British engines in the near future. This would relieve the pilot of continually having to adjust the throttle to avoid exceeding engine-temperature limitations.

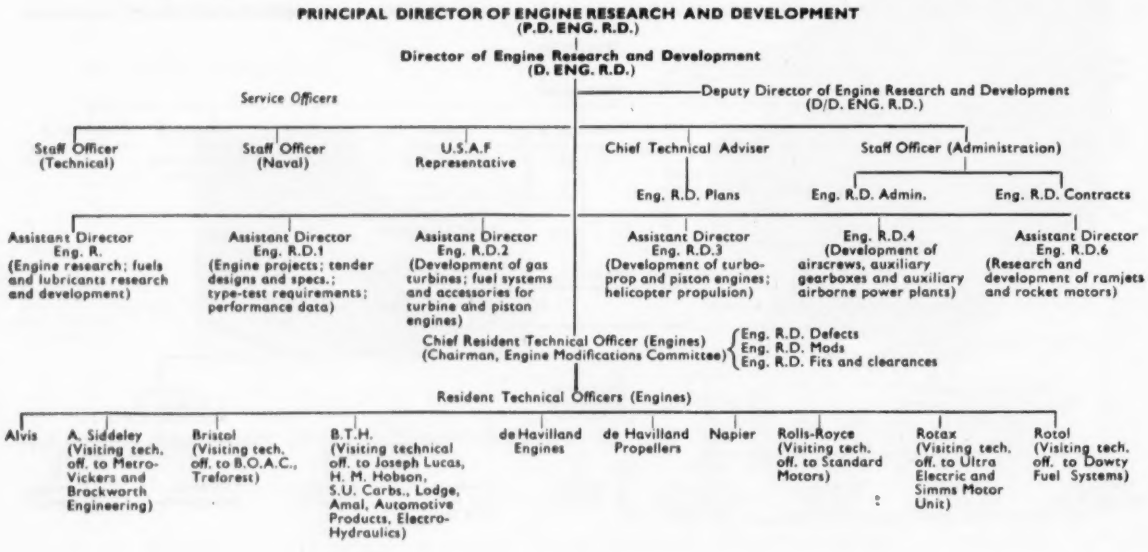
The reason for accepting production engines at a lower j.p.t. than that cleared on type-test was not only to cover the altitude case, but also to meet the sea-level tropical condition, of high inlet temperature. Often, type-tests were run with smaller-than-standard final nozzle area to clear for high temperature—which procedure, incidentally, gave higher-than-brochure thrust.

In so far as reliability was concerned, the test-bed thrust was secondary in importance to r.p.m. and turbine-inlet temperature. But, taking the case of the propeller-turbine, we in Britain *were* interested in the actual shaft horsepower developed on account of reduction-gear and airscrew stressing.

Details of the actual tests of the strip and examination following production test, of regular technical meetings to discuss progress and of continued development and design refinement were then discussed by A. Cdre. Banks, who then turned to the organization of his directorate in the M.o.S., illustrating by means of a chart (reproduced here).

Directorate Organization.—The lecturer drew particular attention to the total number of personnel employed—scientific, technical, clerical, at headquarters and at the engine firms—namely, 144. He said that since the man and not the machine was the controlling factor in the creation of

Fig. 2. Organization of the Directorate of Engine Research and Development. Its total personnel strength is 144.


PRINCIPAL DIRECTOR OF ENGINE RESEARCH AND DEVELOPMENT (P.D. ENG. R.D.)
Director of Engine Research and Development (D. ENG. R.D.)
Service Officers
Deputy Director of Engine Research and Development (D/D. ENG. R.D.)
Staff Officer (Technical)
Staff Officer (Naval)
U.S.A.F Representative
Chief Technical Adviser
Staff Officer (Administration)
Eng. R.D. Plans
Eng. R.D. Admin.
Eng. R.D. Contracts
Assistant Director Eng. R. (Engine research; fuels and lubricants research and development)
Assistant Director Eng. R.D.1 (Engine projects; tender designs and specs.; type-test requirements; performance data)
Assistant Director Eng. R.D.2 (Development of gas turbines; fuel systems and accessories for turbine and piston engines)
Assistant Director Eng. R.D.3 (Development of turbo-prop and piston engines; helicopter propulsion)
Eng. R.D.4 (Development of airscrews, auxiliary gearboxes and auxiliary airborne power plants)
Assistant Director Eng. R.D.6 (Research and development of ramjets and rocket motors)
Chief Resident Technical Officer (Engines) (Chairman, Engine Modifications Committee)
Eng. R.D. Defects
Eng. R.D. Mods
Eng. R.D. Fits and clearances
Resident Technical Officers (Engines)
Alvis
A. Siddeley (Visiting tech. off. to Metro-Vickers and Brockworth Engineering)
Bristol (Visiting tech. off. to B.O.A.C., Treforest)
B.T.H. (Visiting technical off. to Joseph Lucas, H. M. Hobson, S.U. Carbs., Lodge, Amal, Automotive Products, Electro-Hydraulics)
de Havilland Engines
de Havilland Propellers
Napier
Rolls-Royce (Visiting tech. off. to Standard Motors)
Rotax (Visiting tech. off. to Ultra Electric and Simms Motor Unit)
Rotol (Visiting tech. off. to Dowty Fuel Systems)

an engine (or anything else, for that matter), the question of personnel was of the first importance; and the exercise of benevolent control by a minimum of Ministry staff was possible only if experienced individuals were available.

Practically all the technical and scientific staff in the aircraft and engine directorates of the M.o.S. were civil servants, although there was a sprinkling of Service officers heading some of the directorates and sections. There were Royal Navy and R.A.F. officers on the staff, whose duties were to supplement the normal contacts with the Services and to keep in touch with their respective Services regarding behaviour of the equipment in the field. This group also included a U.S.A.F. officer, who was attached to the directorate on the exchange basis now operating between the two countries.

A. Cdre. Banks favoured a hard core and a high proportion of civilian technical staff in these directorates, since their individual and aggregate experience was considerable; and they were able to guide and advise any officer personnel who might head a directorate from time to time, but whose tour of duty (usually three years) was hardly sufficient, without some previous background of experience, to permit the exercise of balanced judgment without such advice. He did not believe in putting civil servants in uniform and, therefore, rendering them subject or subservient to military law and discipline, except for their own protection in a theatre of war.

Gas Turbine Development.—Under the heading of "Engine Development" A. Cdre. Banks gave it as his opinion that there were only a few firms in the world today who really understood the art of developing and building a successful aviation engine and who could carry the whole effort through effectively and expeditiously.

While the aviation gas turbine was taking the place of the piston engine for most, if not all, important aircraft applications, and responded more readily than the latter to theoretical treatment in the design stages and prior to prototype manufacture, it was not until it got into the hands of the legitimate aviation-engine manufacturer that it really progressed. In fact, it was due to the accumulated experience of the aviation piston engine in the last 30 years that the gas turbine had progressed so rapidly.

The industrial engineering firms had been the first to be introduced to the aviation gas turbine because they alone had had any sort of turbine experience, which was thought (wrongly) to be needed for this engine's successful future development. The war, and their own prejudices, prevented or delayed the acceptance of this new prime mover by the legitimate aviation-engine builders. The industrial firms did, however, make one or two good attempts to design and build a workable turbojet engine.

These concerns, with many years' experience in the manufacture of massive steam-turbines and electrical generating plant for public utility purposes and for ship propulsion, could hardly have been expected, almost overnight, to get down to such a lightweight piece of mechanism as the aviation engine. Since little or no restriction was placed upon the weight of ground plant, it was not necessary to obtain the absolute maximum output or to reduce scantlings. Indeed, it would have been quite uneconomic to to so

These conditions had always governed and enforced conservative practices in the industrial field, and it was surprising that any progress was made at all with the aviation gas turbine by the industrial engine firms. But, in the lecturer's opinion, it would take another ten years for those industrial organizations remaining in this very specialized business to master the design technique and development of the aviation engine—and then only if they were willing to learn by bitter experience. And where would the *successful* aviation engine firms have progressed by that time? He had underlined the word "successful" since some of the legitimates in the aviation industry had "fallen flat on their faces" and nearly to ruin, due to lack of a sound engineering policy and good technical control; or as the result of being overridden by bankers and accountants, who came in at the top due to previous bad management, and then tried to dictate technical policy.

The Time Factor.—A. Cdre. Banks continued by saying that contrary to optimistic prognostications of six or eight years ago, when it was thought that the turbojet could be designed, built and type-tested within two years, the modern axial engine took about the same time to bring to the type-test stage as did the larger and more complex piston engine. But the gas turbine, whatever its type, got through the flight-test stages and into actual service much more quickly than the piston engine—principally due to the considerably reduced mechanical and installational problems and the almost complete lack of cooling requirements. The day-to-day inspection and maintenance of the gas turbine in military and in airline service absorbed far fewer man-hours than did piston engine inspection.

On the subject of engines for civil use, the Air Commodore said that since the last-war military requirement had not always included the particular engine types wanted for airline operation, and in certain cases it had been necessary to design and build engines (propeller turbines) specifically for civil purposes. This had meant the introduction of engines having no previous flight background, the accumulation of which then fell upon the aircraft manufacturer and the airline operator.

Of the rapidity with which gas turbines could be put into regular flight service, the lecturer said that in only nine months of scheduled airline operation, the Ghost engines in the Comet had shown a failure rate of 0.49 per thousand hours flying, which was superior to that (0.60) of two well-tried air-cooled radial piston engines. It was also of interest that, on January 22nd last, de Havilland's chief test pilot completed 1,000 hours of test flying in the Comet without any serious mishap.

The time factor in engine development, assuming an axial turbojet of 8,000 to 10,000 lb thrust, was estimated as follows: design about one year; building of first prototype a further twelve or more months; during the following three years 8,000 to 10,000 hours of engine bench running and 2,000 hours of flight testing; 3,000 to 4,000 engine hours bench running was a good yearly figure in the fourth and fifth years. The lecturer said he had thought that with great accumulated knowledge of the axial compressor it would have been possible to see a reduction in this four- or five-year period, but there was still a number of problems to be mastered, and the same old troubles of compressor stall, blade vibration and flutter remained. Designers were, however, in a better position to overcome these troubles more quickly than was the case a few years ago.

Skilled Apprentices and Design Staff.—A. Cdre. Banks' next remarks will be of particular interest to *Flight* readers in view of recent articles on skilled manpower, opportunities and pay in the aircraft industry. He said that, in his opinion, there was one important difference between British and American practice as affecting the rapidity of prototype engine manufacture. Britain still had some good trade or craft apprentice schemes in her engine firms which produced skilled workmen (fitters and machinists), with the result that experimental engines could be built relatively quickly and with the minimum of jigging and tooling. Admittedly, we were at present short of skilled labour. This was due to the fact that the state of our national economy was such that there had been an almost barometric variation in the orders given to the aircraft industry, according to the state of world politics; and labour, particularly, was chary of an industry which only appeared to prosper in time of war or national emergency, and would rather remain in the more stable industries whose operations were relatively steady or less subject to violent change.

There were also insufficient highly qualified men coming from the British universities and technical colleges, and already this deficiency was being felt. We did, however, appear to have a more stable condition in our design offices. He understood that, in the United States, the young man did not generally take kindly to the idea of spending some years engaged upon engineering design and could earn better promotion and money on the production floor or in the field.

In Britain a designer was thought to have a quite promising professional career ahead of him; and he could eventually become chief engineer of his firm, particularly if he had had previous experience in other departments before going to the design office. In any case, a young man should go through the plant (the machine shops, the experimental departments and, also, the servicing departments) before entering the design office, otherwise he was likely to perpetrate "quite impossible" designs.

Later the lecturer repeated that it was the man that mattered rather than the machine. To get experienced aviation engine designers and development engineers it was necessary to pay them well, because one was buying "experience that is not in any book."

"British Engines can be Produced."—A. Cdre. Banks next touched on a matter which needed airing before an American technical audience. He said that recent articles in the American Press had stated that the British-designed engines were difficult to produce in quantity. This was certainly not the case when considered in terms of production costs. All aviation engines were relatively difficult to produce, but there were none that he knew of which could not be produced in quantity with the facilities possessed in the United States, coupled with the great ability of its production specialists.

When considering a licensed engine it was very important not to make any change from the original purely to facilitate production. In fact, a licensed engine should be a "Chinese copy" of the original, both in regard to materials and manufacture. Although the particular engine in question had already passed its type test it was still in the early development stage and therefore vulnerable to engineering and material changes. It was quite natural, however, to acquire the licence in the early development stage in order to ensure the most up-to-date product.

It needed great caution and restraint on the part of the licensee firm in making engineering change, particularly for production reasons, where production might just be starting or already in full spate. If there were insufficient running hours behind the design change or modification, subsequent failure in production engines would lead to a chaotic state when dealing with large production rates common in the U.S. A. Cdre. Banks added that the engine he had in mind had less critical material in its make-up than existing engines, and was therefore all the more acceptable when considering wartime production.

Cost: Axial versus Centrifugal.—A. Cdre. Banks next commented on the relative cost of centrifugal and axial engines. He said that the axials had practically all the advantages, but present experience of relatively small production quantities suggested the cost would be twice that of the centrifugal in terms of pounds sterling per pound weight. If, however, the centrifugal were designed for the same pressure ratio as some of the present axials, then it would probably cost more than the latter on the same costing basis.

Limited Testing Facilities.—Before making his concluding remarks the lecturer referred to testing and calibration facilities. He said that, due to limited financial sources, individual British firms had not been able to provide all the facilities considered necessary for the performance-testing and calibration of turbojet engines, particularly at simulated altitude conditions. But by improvisation it had been possible to obtain surprisingly close agreement between component tests and performance of the full-scale engine in the air. He instanced the insufficiency of power for making compressor tests at full output and, as a result, the testing and calibration of compressors of all large engines with throttled air inlets.

Turbine design had been proved and improved by running part-scale wheels with light-alloy blades on cold air; the results had read across very satisfactorily to the full-scale components. Cold-air testing permitted the use of light-alloy blades which could be easily and readily manufactured when a new blade form was required.

Full-scale engines had been instrumented, strain-gauged and calibrated in fighter aircraft and two-way radio communication between the pilot and technical personnel on the ground had been used directly to report flight readings and to permit engine conditions to be altered and controlled as necessary. In this way the altitude characteristics of the compressor and other components had been confirmed.

So far it had been possible to get by, and the absolute need for an altitude test-chamber for full-scale engine tests had not yet been felt. But while there were already available some limited testing facilities at the N.G.T.E., it was realized that additional and elaborate equipment must eventually be provided to meet engine altitude requirements for military aircraft—which were steadily increasing. Though the flying

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test-bed was still a necessary part of the flight development of an engine, a certain minimum standard of engine altitude performance would be demanded before future expensive prototypes took the air. At this point the lecturer showed curves indicative of progress during the last decade and that anticipated by 1960, as follows:—

(1) Since mid-1941 specific fuel consumption for turbojet and by-pass engines at 36,000ft and 500 kt (maximum continuous rating, U.S. normal rating) has decreased steadily from 1.52 lb/hr/lb thrust to 1.05 lb/hr/lb. An extension of the practically straight curve to the year 1960 indicates a figure of 0.825.
(2) A similar curve, but for sea-level static conditions at maximum rating, shows an improvement from almost 1.4 lb/hr/lb thrust to 0.82 today, and by 1960 to 0.60.
(3) Turbojet specific-weight curve (based on net dry weight) for conditions at 36,000ft and 500 kt shows improvement from 3 lb weight per lb thrust at the end of 1942 to 0.95 today. The figure for the Whittle W.1 in 1941 was 3.17.
(4) The specific-weight curve for sea-level static conditions shows a figure of 1 lb weight per lb thrust in mid-1941, 0.475 in 1945, 0.33 in 1950, and 0.28 today.
(5) Thrust per square foot of frontal area at 36,000ft and 500 kt was only just over 50 lb in 1945 and about 180 in 1950; today the figure (engine accessories included) is almost 300 lb/sq ft.
(6) For comparison the figures at the same dates, but for sea-level static conditions, are 210 lb in 1945, 560 lb in 1950, and 940 lb today. While the specific-weight curves are rapidly levelling, those for thrust per square foot of frontal area continue to rise steeply. [The thrust/frontal area curves seem to be representative of the average engine in production. Several turbojets now exist which exceed 1,000 lb static per sq ft of frontal area—Ed.]

Conclusion.—In coming to the end of his lecture A. Cdre. Banks said that success in the aviation-engine industry might be summed up as the ability to profit from long experience and so make fewer mistakes than the next man, and thus to cure the unforeseen or unavoidable errors quickly. Quoting Mr. Frank Owner on the repetition of mistakes, he said: "The first time is an accident; the second a coincidence; and the third a habit."

Other necessary contributions to ultimate success were the establishment by the manufacturer of an efficient technical or field service for aircraft constructor and operator; capable engineers with the right personality to handle awkward situations; and technical collaboration between the principal engine manufacturers.

The lecturer added that a remarkable degree of free collaboration on a firm-to-firm basis was enjoyed in Great Britain. The particular firms concerned visiting each other at regular intervals to discuss their various technical problems. In addition, there was the Gas Turbine Collaboration Committee, formed in the war and still going strong, which met three or four times a year to discuss individual and collective problems and the general technical progress of the aviation gas turbine engine. The G.T.C.C. was unique. Main meetings usually occupied one or two days and each of the principal firms, including the N.G.T.E., took it in turn to act as host. A tour of the host's firm was always made after the technical meeting.

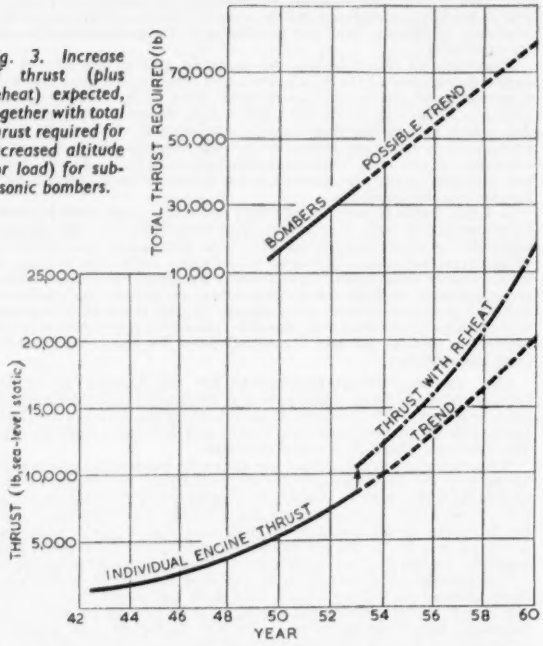

Fig. 3. Increase of thrust (plus reheat) expected, together with total thrust required for increased altitude (or load) for subsonic bombers.

Government support which was the mainstay of modern aviation should be real support rather than rigid control. It should aim to be benevolent and encouraging rather than overriding and interfering.

The engine was the most important part of the aircraft. No effort should be spared to ensure a healthy and successful industry. It should be remembered that failure to take the next step to order new engines might mean ten years in the wilderness, i.e., a five-year wait to see what the other fellow did, plus five years at least for the new engine.

FORTHCOMING EVENTS

Apr. 15. Aircraft Recognition Society: Annual General Meeting.
Apr. 18. British Interplanetary Society: Film Show.
Apr. 20-May 2. I.A.T.A. Technical Conference, San Juan, Puerto Rico.
Apr. 22. R.Ae.S. Gloucester and Cheltenham Branch: A.G.M.
Apr. 22. R.Ae.S. Graduates' and Students' Section: "Accident Investigation," by H. Caplan, D.C.Ae., Grad.R.Ae.S.
Apr. 23. R.Ae.S.: "Civil Jet Operations," by Capt. A. J. Majendie, M.A., A.F.R.Ae.S. (at Glasgow).
Apr. 25-26. R.Ae.C.: Private Air Rally, Co. Wicklow.
Apr. 28. Air League of the British Empire: Aviation Jubilee Ball, London.
May 7. Pathfinder Association and Club: Annual Dinner.
May 9-10. Aéro Club du Finistère: Brest and Côte des Légendes Rally.
May 13. R.Ae.S. Chester Branch: Annual General Meeting.
May 14-17. American Helicopter Society: Forum, Washington.
May 14-22. F.A.I.: 46th Annual Conference, The Hague.
May 16. Wolverhampton Aero Club: Goodyear Trophy Race and Display.
May 21. R.Ae.S.: All-day Meeting on Aeronautical Acoustics (jointly with the Acoustics Group of the Physical Society).
May 23-25. Aéro-Club d'Epernay: Champagne Rally.
May 23. Derby Aero Club: Display.
May 25. S.S.A.F.A.: Display, Yeadon.
May 25. Air Display, Elmdon, Birmingham.
May 25. Women's Junior Air Corps: Display, White Waltham.
May 29. R.Aux.A.F.: Officers' Coronation Ball, London.
May 30. Auster Flying Club: Ragosine-Auster Homing Trophy Competition.
May 30. Swansea and District Flying Club: Display and Race.
June 5-7. Yorkshire Aeroplane Club: International Rally.
June 6. Leicestershire Aero Club: Coronation Air Display.
June 7. Aero-Club d'Italia: Rome Grand Prix.
June 11. R.Ae.S.: Ninth British Commonwealth and Empire Lecture, "Problems in Development of Air Transport in West Africa," by Sir Hubert Walker, C.B.E.
June 13. "At Home," R.N. Air Station, Lee-on-Solent.
June 13-14. Aero-Club d'Italia: Air Tour of Sicily.
June 13-14. Rhodes Centenary Air Display and Rally, Salisbury, Rhodesia.
June 14. Aéro-Club de Tangier: Tangiers Rally.
June 14. R.Ae.S.: Garden Party, Hatfield.
June 15. Coronation Naval Review.
June 16. I.C.A.O.: Opening of Seventh Assembly, Brighton.
June 17. Women's Engineering Society: Annual General Meeting.
June 19. Institute of Navigation: "Accuracy of Wind Forecasts for Aviation," by C. S. Durst and D. G. Harley.
June 19-28. Zurich: British Chamber of Commerce "Made in England" Exhibition (inc. Aviation).
June 20. "At Home": R.N. Air Station, Culdrose.
June 20-21. Aéro-Club de l'Ouest de la France: Anjou Wines Rally.
June 20-21. Aéro-Club de Flers de l'Orne: Normandie Rally.
June 20. Southend Corporation and R.Ae.C.: National Air Races, Southend Airport.
June 21. Aéro-Club des I.S.P.A.: Display, Marq-en-Bareuil, Lille.
June 26-July 5. Paris Aero Show.
June 27. "At Home," R.N. Air Station Bramcote.
June 27. Aéro-Club d'Eure et Loire: Chartres Rally.
June 27-30. Aero-Club di Livorno: International Rally.
June 27-29. R.Ae.C.: Members' La Baule Rally.
June 27. S.L.A.E.: Annual General Meeting.
June 29. Combined R.Aux.A.F. Units: Ball.
July 4-6. R.Ae.C.: Members' Deauville Rally.
July 11. "At Home," R.N. Air Station Anthorn.
July 11. Auster Flying Club: Display.
July 12. Northern Heights Model Flying Club: Gala Day.
July 15. Royal Air Force Coronation Review.
July 18. "At Home," R.N. Air Station Brawdy.
July 18. Royal Netherlands Air Force and Royal Netherlands Aero Club: N.A.T.O. Display, Soesterberg.
July 18-19. Aero-Club d'Italia: Dolomites Tour.
July 19. Aéro-Club de la Vendée: Sables d'Olonne Rally.
July 22. "At Homes," R.N. Air Stations St. Merryn and Arbroath.
July 25. "At Homes," R.N. Air Stations Ford and Stretton.
July 25. R.Ae.C.: National Air Touring Competition.
July 25-Aug. 3. B.G.A.: National Gliding Championships, Great Hucklow.
July 27-Aug. 2. Aéro-Club de France: World Parachuting Championships, Aix-les-Bains.
Aug. 1-3. S.M.A.E.: World Model Championships, Cranfield.
Aug. 8-13. Round-Switzerland Air Tour.
Aug. 22. Coventry Air Day and Siddeley Challenge Trophy Race.
Aug. 30. Aero-Club d'Italia: Pescara Rally.
Sept. 3-10. Aéro-Club de Cannes: Cannes Grand Prix.
Sept. 6. S.M.A.E.: "Yorkshire Evening News" Model Flying Festival, Sherburn-in-Elmet.
Sept. 7-13. S.B.A.C.: Farnborough Display and Exhibition.
Sept. 12. "At Home," R.N. Air Station Eglinton.
Sept. 14. R.Ae.S. Wilbur Wright Memorial Lecture: "Structures," by Prof. N. J. Hoff, F.R.Ae.S., F.I.Ae.S.
Sept. 14-17. R.Ae.S. and I.Ae.S.: Anglo-American Aeronautical Conference.
Sept. 15. Battle of Britain Day.
Sept. 19. "At Home," R.N. Air Station Abbotsinch.
Sept. 19. R.A.F. At-Home Day.
Sept. 20. Aero-Club de Milan: Milan Grand Prix.
Sept. 27. Aero-Club d'Italia: Modena Rally.
Oct. 8. Start of England-Christchurch (N.Z.) Air Race.
Nov. 1-22. I.A.T.A. Traffic Conference, Honolulu.
Nov. 6-11. "Dates" Rally, Biskra, Algeria.
Dec. 17. Anniversary of the Wright Brothers' First Flight.

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THE INDIAN AIR FORCE

— *is Twenty Years Old: Steadily Growing Efficiency*

ON April 1st the Indian Air Force celebrated its twentieth anniversary. It was in 1933 that the first flight of the I.A.F. was formed, at Karachi, from a nucleus of Cranwell-trained Indian officers and a small number of ground personnel. The new unit was soon joined by others, but until the war the total size of the force was quite small—and a considerable proportion of the establishment was filled by R.A.F. personnel.

The original aircraft in squadron service were Westland Wapitis, but some units were converted to Hawker Audaxes and Harts before the outbreak of hostilities. When war came, training was extended in spite of lack of aircraft and other difficulties, and during the first Burma campaign the I.A.F. squadrons were able to make their contribution to slowing-up operations, using Wapitis, Lysanders and Blenheims. In the lull before the second phase in Burma, further re-equipment took place, and the subsequent operations were conducted with Hurricanes and Spitfire 8s and 9s, and American Vengeance dive-bombers. The experience gained in the campaign provided an invaluable background for the post-war Service.

The key positions in the I.A.F. were gradually handed over to Indian officers, and by August 15th, 1947, with the achievement of Dominion status by India, the transfer was completed, excepting that a small number of senior R.A.F. officers were asked to stay on. A few of these remain today, including the present Commander in Chief, Air Marshal G. E. Gibbs, C.I.E., C.B.E., M.C. The senior Indian officer is A.V-M. S. Mukerjee, O.B.E., who was a member of the original Wapiti Flight in 1933. Up till August, 1947, the Indian Air Force—in common with the Army and Navy —had been under the control of a combined G.H.Q., but the three Services were then separated and individual Cs-in-C. appointed. Air Headquarters were set up in New Delhi, with two Commands, Training and Operational.

Turning now to the I.A.F. as at present constituted, there are two methods by which prospective G.D. officers may enter. One is by direct entry through a competitive examination when the candidates have reached a suitable age; the other is for boys of 15-16 years of age who, if selected, can enter the Armed Forces Academy in Dhera Dun, where they undergo three years of training in company with Army and Navy cadets. Three-quarters of the syllabus is academic, the rest technical, and the training together of cadets destined for all three Services is expected to lead to good co-operation.

On leaving the Academy, or on direct entry, the candidate passes on to one or other of the two flying schools—No. 1 at Hyderabad, where Tiger Moths and Harvards are in use, or No. 2 at Jodhpur, where there are Prentices and Harvards. At these schools the "all-through" method is employed: that is to say, the successful pupil during his 18 months' stay receives his flying training from one instructor only, and all the necessary ground work is carried out on the same station, in accordance with a syllabus and routine very similar to those of the R.A.F., except that flying is curtailed in the summer by the adverse conditions during the heat of the day.

When wings have been won, and commissions gained, the young officers go to the Conversion Training Units, either the single-engined C.T.U. at Hyderabad, or that for twins at Agra. Courses here last four and a half months, and the aircraft in use at the moment are Tempests, Spitfire 9s, and Dakotas. Dual Vampires will shortly be available as well. When these courses have been completed, the full-fledged pilots go on to the squadrons, of which there are now a considerable number. Aircraft in service include Vampires, Spitfire 18s, and Tempests for fighter and ground-attack duties, Dakotas for transport (including V.I.P. communication) and photographic survey work, and Liberators for bombing and coastal patrols.

Up till two years ago, instructors were trained by the R.A.F. in England, but now they are all trained at Ambala in Northern India, where the courses last five months. The R.A.F. instrument-rating system has been adopted, and teams from C.F.E., C.F.S. and Transport Command are frequently invited to India to check on methods of instruction, categorization of multi-engined crews, and so forth. Eventually, the Indians intend to carry out all these checks themselves. Officers from the I.A.F. regularly attend courses at the Imperial Defence College and at the R.A.F. and U.S.A.F. Staff Colleges, and they also take part in flying and technical courses at various R.A.F. and R.A.A.F. centres. At home, they have their own Defence Services Staff College at Wellington, in Southern India, where the courses for senior Army, Navy and Air Force officers are based 75 per cent on their own Service subjects, and 25 per cent on inter-Service matters.

So far we have referred to aircrew personnel only, but naturally the need for technicians and tradesmen of all ranks is paramount, and they also are obtained either as direct entrants (who are then trained at various ground-training schools) or as apprentices, who pass through the Technical Training College at Bangalore, which is run on similar lines to our R.A.F. School of Technical Training. The English language remains compulsory for all personnel.

Day-to-day maintenance is, of course, carried out by units on stations, but major repairs are effected at the Base Repair Depot at Kanpur. The Indian aircraft industry also provides facilities when required. This industry, incidentally, has recently designed and produced an elementary trainer, the H.T.2, which has proved successful enough to be ordered in quantity as the replacement for Tigers and Prentices.

Buildings, messing accommodation, facilities for officers, N.C.O.s and other ranks, and similar material necessities remain largely similar to those of the R.A.F. abroad; but a new building programme was launched in 1949 and, considering the financial difficulties, good progress has been made.

The aim of the officers who have built up this relatively young air arm has been to secure a really worthwhile force, in which quality and mobility are first essentials, together with the ability to expand if necessary. In this aim they appear to have been fully successful.

An I.A.F Dakota over terrain typical of the mountainous parts of India.

Our American Correspondent Reports . . .

ALTHOUGH it is now some time since the Royal Air Force Canberras returned to England after their success-story visit to South America, tales of the tour continue to reach the States. And they make fine hearing. Friends lately back from Latin America all testify to the good that this visit did to British prestige, and those who have had experience of overseas negotiations—particularly in South America—will realize what this means in terms of goodwill and trade.

A story about the Canberra tour at present circulating here illustrates how necessary this sort of thing is. It may or may not be true, yet it is so typical of what actually happens (but what is too-seldom realized in some quarters as happening) that it's worth repeating. Apparently, when the Canberras visited one of the smaller Central American States the aircraft were described in the local paper as being American. The British on the spot remonstrated, to be met with the reply "But they must be American. They are jets. And only America makes jets."

However unlikely this may seem, it is an excellent example of what can happen, just as the tour was an equally good example of how to put such a situation right. It may also be some reward for the crews of the Canberras to know that good repercussions are continuing—and some recompense for the work, and sweat and headaches (and perhaps hangovers) that they must have put into it. Incidentally, the writer has heard that it was not considered necessary to send any spare engines for the Canberras, nor did they need any. If this is so, it is a pity that publicity of the fact was not released. It might have surprised those Americans who are still apt to look on the jet engine as unreliable.

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IN *Flight* of December 19th it was reported that United Air Lines had, for safety reasons, reduced the seating capacity of their "coach" service DC-4s. The repercussions of this action have almost died away, but the fundamental problems of emergency exits and safety precautions which it raised have not. It may be remembered that United announced that they were proposing to cut down the number of seats from 64 to 54, pending the introduction of additional exits. This was greeted with sour looks from the other operators, who opposed a reduction in capacity (because of the consequent loss of revenue), and by definite resistance from the C.A.B. The latter informed the United Air Lines president, Mr. Patterson, that the company were to continue their coach service with the seating densities that had been authorized, and that they, the C.A.B., considered such densities perfectly safe. They also maintained that a reduction in the number of passengers would make the services uneconomical.

In reply, Mr. Patterson took a full page advertisement in 75 of the leading newspapers throughout the nation and affirmed, in print, his action and his reasons for taking it. He said, in so many words, that he and his company were not prepared to compromise with safety. Subsequently he questioned the authority of the C.A.B. to dictate, on economic grounds, the number of seats that carriers must provide on coach aircraft—an argument which, had it continued, could have raised the whole question of the degree of governmental control at present exercised over the American operators. For, whatever anyone says, there is a very considerable degree of such control in the States; and the fact that the Civil Aeronautics Board have the responsibility of allocating the mail pay by which the operators are subsidized ("a heavily subsidized undertaking at present," a Senator recently called it) makes a degree of financial control essential—and, quite naturally, causes the C.A.B. to be sensitive on the subject of airline economics.

There are, of course, those who feel that Mr. Patterson was correct in what he said; but not many people approved of the way he said it. The public is only too ready to believe that flying is still a risky business, despite the fact that there are indications that in other forms of surface transport those travelling by the cheaper methods appear willing to accept a greater degree of risk than does the first-class passenger. Tourist passengers on the lower decks of a steamship would seem to have less chance of escape in a grave emergency than those on the decks above them, and the third-class wooden coaches one still sees on some railways are obviously more vulnerable in the event of a collision than are the modern steel cars. For that matter, a motor-coach trip may be more dangerous than a similar journey by train. Such an approach cannot be applied to aviation, however, and the best answer to the problem of safety in tourist aircraft (apart from the obvious one of avoiding accidents in the first place) seems to be to have a sufficient number of exits—one to each set of seats, in fact, as is the case with the Viscount.

As a result of the United Airlines fracas and perhaps because of some very outspoken comments which recently appeared in a technical paper prepared by a well-known consultant here, one expects some revision of the C.A.B. emergency-exit requirements before too long.

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THE general public's interest in the world's speed record appears to be on the wane. Last year the figure of 699.9* m.p.h. set by a North American F-86D Sabre didn't really get the publicity or applause that was accorded to the previous American successes. This is probably due to the fact that the man in the street is now unable to visualize, or fully appreciate what 700 miles an hour looks, sounds, or feels like; the continual ballyhoo that goes on about the sonic barrier has dulled his sense of excitement. As for speeds of over Mach 1 (he says) who was Dr. Mach anyway? And can't a rocket do 3,000 m.p.h.? But interest isn't dead in the manufacturing or publicity worlds, and one of the aviation magazines here had a paragraph which announced that Miss Jacqueline Cochran was hoping to have a go at the record on a Canadian-built Sabre, probably fitted with the Avro Orenda engine. In the same paragraph was the rather surprising statement that she had joined the Canadair test staff (presumably for this very purpose).

About a year ago there were rumours that Miss Cochran was trying to influence the U.S.A.F. into letting her have an American Sabre for such an attempt, but apparently the Air Force felt, understandably, that if anyone was going to make the record it should be one of their own pilots. So it now looks as though Miss Cochran—who has several world records to her credit and whose entry in the Mildenhall-Australia race may still be remembered—has tried elsewhere.

Quite what the test staff at Canadair, or the R.C.A.F., feel about the proposal—if indeed it is a serious proposal—is not known; but a recent announcement here that the Dynamics Corporation, which controls Canadair, was in negotiation with Mr. Floyd Odlum (Miss Cochran's husband) for his shares in Consolidated Vultee of San Diego sheds further light on the matter, and might well improve Miss Cochran's chances of getting an aircraft in the future. [As reported elsewhere in this issue, the share negotiations are completed.—ED.] Actually, there must be two or three new American fighters which are now in the development stage and which are all faster than the Sabre.

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THE American lawyer's ability to make a case, and his legal language, are second to none. The following delightful piece appeared recently in *American Aviation Daily*:—

United Sued in Dog Episode.—United Air Lines has been named defendant in a $4,400 damage suit filed by a woman passenger, a California kennel operator, who claimed her pedigreed black poodle was "forced to and did submit . . . to various and sundry low-bred mongrel dogs" when allowed to escape while in the custody of U.A.L. baggage handlers at San Francisco and thereby "suffered extreme humiliation, shock, trauma and other psychological difficulties not presently diagnosed," the United Press reported today.

*This figure is now amended—see page 478—Ed.

ANTI-SUBMARINE

For service in the Royal Navy—Fairey Gannets will operate from Fleet and Light Fleet Carriers. The Gannet is the latest specialised anti-submarine aircraft produced in Britain.

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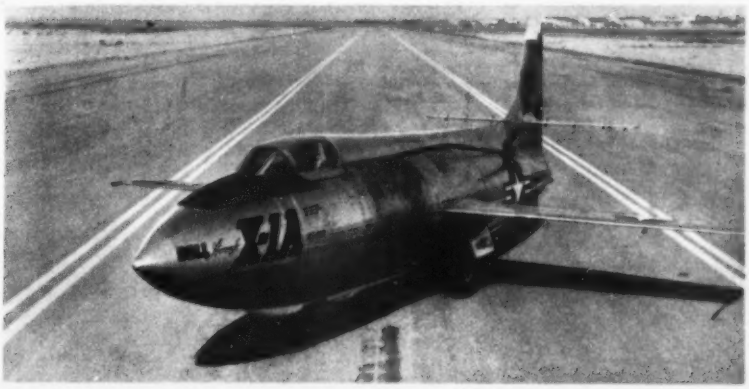


FOR SUPERSONIC RESEARCH: Bell's new X-1A is clearly a descendant of the Bell X-1, which is generally agreed to have been the first supersonic aircraft. The X-1A retains the original four-cylinder 6,000 lb-thrust rocket motor, but has a turbine-driven fuel pump, providing greater endurance than the X-1s pressurized tanks. The new machine is being flown by "Skip" Ziegler from B-29 mother aircraft.

Great Britain

Airspeed Ambassador. American sources have stated that British European Airways plan to convert eight of their Elizabethan-class airliners into Nomad-powered freighters. Mr. Peter Masefield, B.E.A. chief executive, recently said that the Corporation was "interested" in the Nomad but was clearly not prepared to allow anything more definite to be published at this stage.

France

S.O.4050 Vautour. This large, supersonic attack bomber has now completed its initial test flying, with about 20 flights to date. The first prototype is powered by two S.N.E.C.M.A. Atar 101B turbojets of 5,500 lb thrust each, but it is stated that the installation makes provision for more powerful Atars (the 101C and D, of up to 8,000 lb thrust) and also other turbojets of "much greater power." The latter are probably the big Vulcains.

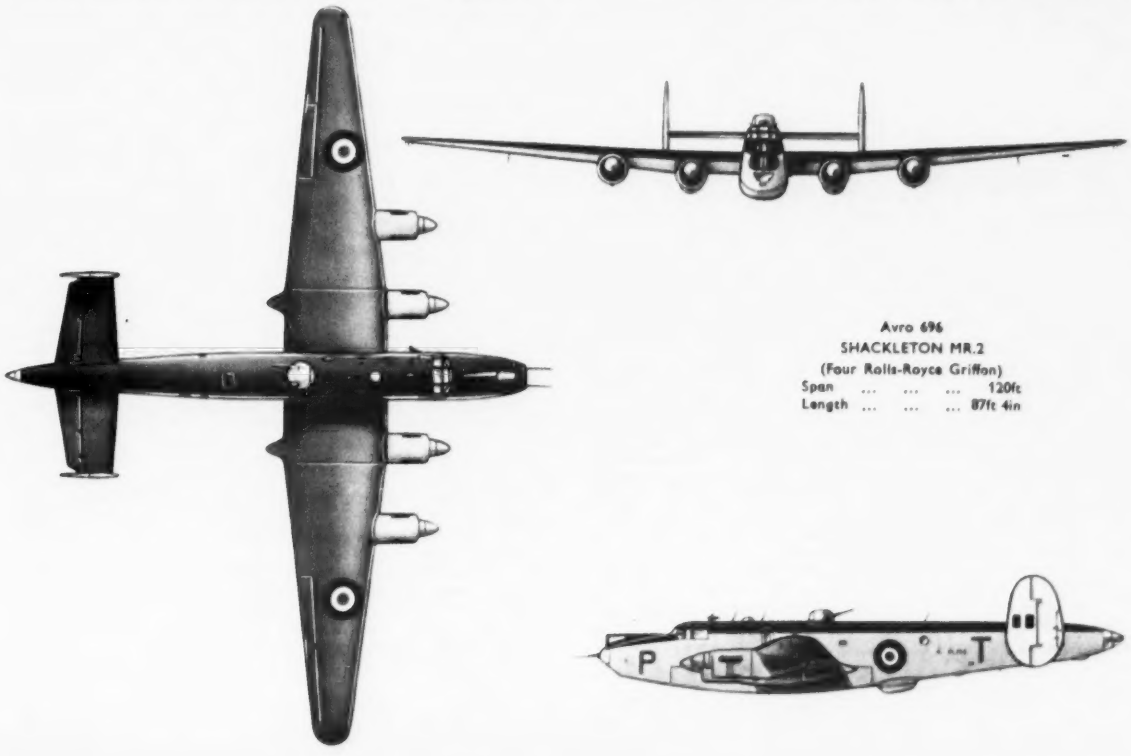
United States

Convair R3Y Tradewind. Powered by four Allison T40 turboprops, this large flying-boat is a development of the XP5Y patrol prototype; the first Tradewind should fly in about 12 weeks' time. The main differences from the XP5Y are the provision of a fully pressurized and air-conditioned hull with large freight-loading doors, an increase in the area of the dorsal fin, revised wing-tip floats with vee-bracing struts, and complete re-design of the power units. The original T40—a double engine driving contraprops, each engine being geared to both airscrews—was unduly long, with a heavy extension shaft to a forward gearbox. The Tradewind engine is much neater and shorter, and also has shorter tail-pipes ejecting on top of the nacelle above the wing trailing-edge. Twelve R3Ys are now being built at San Diego for a U.S. Navy trans-Pacific service next year. Later aircraft will have nose loading-doors.

Douglas Attack Aircraft. Although it is giving excellent service in Korea, the AD Skyraider is considered too slow for use against strong opposition. It was developed into the A2D Skyshark which, powered by an Allison double turboprop unit, doubled the speed to about 500 m.p.h. Although the Skyshark flew four years ago production is far from certain, for the T40 engine is non-operational. The next attack design was the great A3D twin-jet carrier-based bomber, with a speed of some 630 m.p.h. The prototype is powered by two Westinghouse J40s with afterburners, but other engines may be adopted for production versions. Finally, in order to provide the Marine Corps with a fast strike aircraft, the A4D is being developed. This will be powered by a single Wright J65 Sapphire and will be supersonic. It should be a very useful type, with ability to do work now requiring several different aircraft.

Northrop XB-62 Snark. It can now be stated that the Northrop company have a U.S.A.F. production order for the Snark. This is a pilotless bomber powered by a turbojet, and roughly parallels the Matador. Snarks are being flown from the Northrop plant in California to Patrick A.F.B. in Florida in C-124 Globemaster transports, for flight-testing at the latter base.

Republic XF-91. Named by the company "Thunderceptor," this is an experimental fighter which has been flying some three years. Among other novel features it has an inverse-taper wing with variable incidence and a main undercarriage resembling that of the Valiant, retracting outwards into the wing tips. Following upon its recent supersonic flying it has been given a "butterfly" vee-tail, with sweepback. It is being used to assist in the development of new Republic fighters, of which the XF-103 is said to be the most important.



Avro 696
SHACKLETON MR.2
(Four Rolls-Royce Griffon)
Span 120ft
Length 87ft 4in

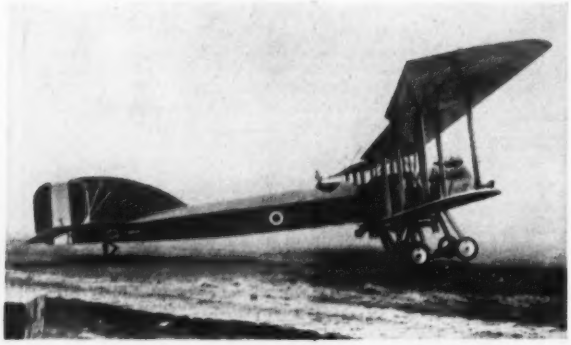
NIEUPORT TWO-SEATER

SHORT BOMBER

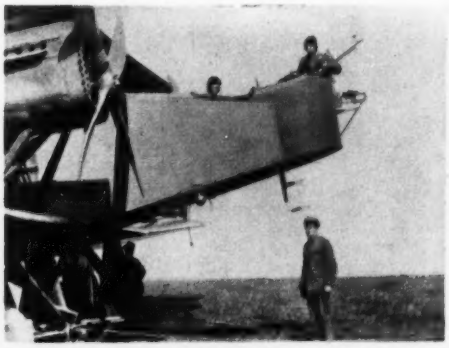
NOVEMBER 191

No. 207 Squadron

HISTORY OF A FAMOUS



The Rolls-Royce-engined Short bomber—the squadron's original equipment. Span was 85ft and it carried 4 x 230 lb bombs.



Pilot and front-gunner/observer/bomb-aimer in a 207 Handley Page 0/400. The bomb-sight was designated H.A.1a.

The Handley Page 0/400 wc tractor in operation at Liges

THOUGH No. 207 Squadron undoubtedly derived from No. 7 Squadron, R.N.A.S., its parentage is complicated by the fact that there were two No. 7 Squadrons of the Royal Naval Air Service. The first started life in the campaign of the late Field Marshal Smuts against the Germans in East Africa in 1916, and the second at Petit Synthe in France in November of the same year. The units co-existed for only two months, because the Admiralty ordered No. 7 to return to England from Africa on January 12th, 1917. It may well be that the two months in question represent the time overlap in closing down the squadron in Africa and reforming it in Europe. In the light of the foregoing it would, therefore, be wrong to omit reference to No. 7 (Naval) Squadron (German East Africa).

At the beginning of April 1916, the South African troops under Major-General Van Deventer moved forward from Arusha but, because of flood conditions, they had to manage without help of aircraft until a month later, when all the naval air personnel on detachment on the mainland from Zanzibar were brought under Sqn. Cdr. E. R. C. Nanson (who retired as a group captain in 1945) and named No. 7 (Naval) Squadron.

To quote H. A. Jones in the official history, *War in the Air*: "On taking over, Sqn. Cdr. Nanson at once made arrangements to send petrol and spares to Kondoa Irangi. Flt. Sub. Lt. Gallehawk set out for Kondoa with four mechanics and 1,000 porters. The party paused at Lol Kissale for four days to make the beginnings of an aerodrome, and then pushed on to Kondoa where, after a hazardous journey during which three porters were eaten by lions, they arrived on May 28th. Flt. Sub. Lt. Gallehawk directed his men in the cutting and burning of mealie fields until a passable aerodrome resulted."

Two pilots, Flt. Lt. W. G. Moore and Flt. Sub. Lt. N. G. Stewart Dawson, left Mbuyuni in Canton-Unné-powered Voisins on May 30th to fly into the new airfield. Both were misled by faulty maps and landed on the Masai plateau, whence they trekked to Ufiome. The two Voisins, which were both undamaged, were flown to Kondoa on June 6th—one by Sqn. Cdr. Nanson, who had by then arrived at Kondoa with light transport.

The aircraft were immediately used for reconnaissance and bombing, and reports filtered through that the native porters attached to the German troops, still thinking aircraft to be of supernatural origin, dispersed in panic each time a Voisin appeared over them. The enemy shortly began to withdraw, and their retreating columns were incessantly bombed.

As previously mentioned, on January 12th, 1917, orders were received for the withdrawal of No. 7 from the interior and for No. 26 Squadron, R.F.C., to take over all aircraft, transport and stores. During the period that No. 7 had been operating in the interior the unit's six pilots had flown 85,000 miles (probably at an average ground-speed of about 60 m.p.h.) without loss and without serious breakdown.

The unit's second birth, or its rebirth, occurred at Petit Synthe in France in November 1916, where it was equipped with twin-engined Caudrons and Short bombers and placed under the command of Sqn. Cdr. C. L. Courtney (now Air Chief Marshal Sir Christopher L. Courtney, G.B.E., K.C.B., D.S.O.). The main task was the bombing of enemy warships in Bruges and Zeebrugge harbours.

In April 1917, still as No. 7 Squadron, R.N.A.S., the unit moved to Cauderkerke, where, under the command of Sqn. Cdr. S. W. K. Allsopp, it was re-equipped with Handley Page 0/400s. Being something of a show squadron, they were visited by officers of the Allied High Command and the King and Queen of the Belgians, both of whom made flights in a 0/400. Their pilot was Sqn. Cdr. J. T. Babington, D.S.O., who, at the end of June, had taken over command from Sqn. Cdr. Allsopp.

During the second battle of Ypres, in August 1917, railheads and ammunition dumps became the squadron's main objective; and one such raid on Thourout, where nine tons of bombs were dropped by 14 aircraft, showed how, even at that time, the weight of a bombing attack had begun to grow.

The squadron's career, however, was very chequered—in September 1917 one flight returned to England as an anti-submarine unit to operate from Redcar. A month later this flight moved to Manston to become R.N.A.S. "A" Squadron.

In April 1918, after the formation of the R.A.F., the whole squadron, now known as No. 207, withdrew to England—Andover—to re-equip with new Handley Page bombers, returning to France on June 7th under the command of Maj. G. L. Thomson, D.S.O., at Ligescourt. The unit was now part of the Independent Air Force and was attached to No. 54 Wing for special night-bombing operations. Maj. Thomson's command lasted for but a short while; in July, Maj. T. A. Batchelor became the C.O., and when he was injured in a crash early in August Maj. G. R. Elliott took over.

The last months of the war were spent on a night-bombing offensive, chiefly against railway centres at Peronne, Cambrai and Valenciennes. During August 1918, the unit dropped over 100 tons of bombs in six nights.

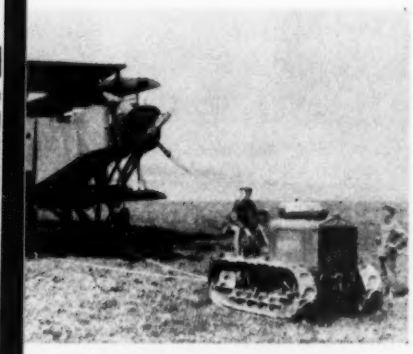
Then followed a short spell of duty with the Army of Occupation, after which No. 207 was transferred to Hangelar and reduced to cadre strength in August 1919. The squadron aircraft were handed over to No. 100 Squadron for duty in the Mediterranean and the unit returned to England, to be disbanded at Uxbridge on January 20th, 1920.

The disbandment was of very short duration—less than a fortnight—and on February 1st, 1920, the squadron was re-formed at Bircham Newton as a permanent R.A.F. unit. Records for this period are sparse, and for the period from re-forming until September 1922 there is no information.

BOMBER UNIT

BY JOHN YOXALL

PART I



e first British type to defy manhandling: a Clayton in 1918. Folding was necessitated by hanger size.

Early "Tallboy". A large riveted-case bomb made specially for the O/400 to carry. Sizes up to 3,300 lb were manufactured.

Maj. Sir John Simon, R.A.F. (now Lord Simon), inspecting No. 207's aircraft.

In 1922 trouble arose between Greece and Turkey and on September 19th news came from the Air Ministry that the unit was to embark for Constantinople on the 29th. The advance party, in the charge of F/L. Trevethan, left for Liverpool on the 26th and, after an inspection by W/C. Pretyman, the squadron—under the command of S/L. A. W. Tedder (now Marshal of the Royal Air Force Lord Tedder)—embarked in the two ships S.S. *Ebos* and *Khartoum*.

Constantinople (now Istanbul) was reached on October 11th, and there considerable difficulty in unpacking was experienced. No lighters or stevedores were available, neither were there any flat trucks capable of taking the D.H.9A cases. No facilities at all existed at the airfield for unloading heavy crates, and the B.E.7 hangars were quite unsuitable for the heavy weather they had to withstand. Despite these handicaps the squadron received a commendation from the G.O.C., Lt. Gen. Sir Charles H. Harrington, on the "workmanlike appearance and the efficient and expeditious way in which the aircraft were erected and brought into action."

Owing to the weakness of the hangars, the D.H.9As were picketed out in the open; and, as no dope was available, the fabric suffered badly. The airscrews also gave trouble, many having to be changed after five hours' flying. The brass sheathing was prone to split, and in a number of cases the blades cracked the whole length of the laminations.

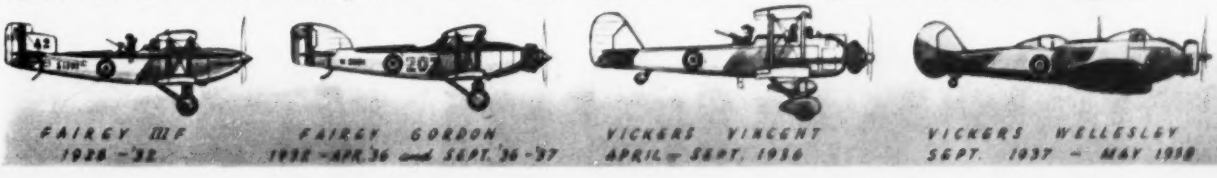
The airfield—San Stephano—was in a pretty shocking state from floods and frost, a third of it being permanently unserviceable. The fitting of split-axle-type undercarriages to the D.H.9As helped to cure some of the troubles with the hard, dry and rutted ground which followed the floods.

Officers of No. 207 Squadron in 1918. In the centre, seated, is Maj. G. R. Elliott, the C.O.

In July 1923 the political situation remained quiet, and S/L. Tedder was posted from the squadron to take a naval staff course. He was succeeded by S/L. V. Gaskell Blackburn, D.S.C., A.F.C., who, two months later, brought No. 207 back to England, where it proceeded to Eastchurch in company with No. 25 Squadron.

November was spent mainly in unpacking and erecting the squadron aircraft, a task which was completed in time for Christmas leave. Early in 1924 an interesting note appears in the squadron records, saying that R.A.E. silencers were fitted on several aircraft, "but the effect was not so great as had been expected." It was about this time, also, that radio telephony was first installed in the squadron's machines.

The R.A.F. Pageant—held annually in the 1920s, when peace really meant peace and cold wars had not been thought of—was taken very seriously: No. 207 moved up to Spittlegate six weeks beforehand to rehearse formation flying with No. 39 Squadron. For their share in the Pageant they received a message of



FAIREY BATTLE MAY 1938 – APRIL 1940

AVRO MANCHESTER 1940

No. 207 Squadron . . .

congratulation from Lord Trenchard, saying it was the "most wonderful flying yet seen."

On returning to Eastchurch the squadron went into training for the bombing trials against H.M.S. *Agememnon*. The author of this history was privileged to watch these trials from H.M.S. *Champion*. It was wonderful to see the old battleship steaming along entirely under radio control while the aircraft appeared at fleeting intervals between the clouds. A number of hits were scored. What stands out most in one's memory of this event, however, is that *Champion* was swept by a huge wave which poured through the open skylights of the wardroom, where the assembled visitors were being entertained.

The squadron now having R/T., it is not surprising to read of further complication creeping in. During October 1924, a lecture on D/F. by F/L. Oddie was listened to with considerable interest by the pilots, who were given a practical demonstration by a special Bristol Bulldog. Air-to-ground range, W/T. 20 miles, R/T. 5 miles; air-to-air range, W/T. 5 miles, R/T. 1 mile—these were the average results.

Again in 1925 the squadron moved up to Spittlegate for the R.A.F. Display rehearsals, and again bombing trials were made against the old *Agamemnon*. Bombing runs were made at 14,000ft, 12,000ft, 8,000ft, and 4,500ft. Two direct hits were recorded. In September of the same year the big army manœuvres took place, and No. 207 was part of "Mercia's" forces. In the three-day "war" its main duties comprised long-distance reconnaissance and bombing raids.

Towards the end of 1925 the issue of parachutes to the squadron was begun, and by December there were sufficient to equip each aircraft. Records state that "No practice jumps were attempted owing to bad weather"!

Early in the new year the squadron lost S/L. Gaskell Blackburn as its C.O. He was promoted to wing commander and assumed command of No. 9 (Bomber) Squadron. S/L. J. G. Graham, M.C., A.F.C., took over. Another trip to Spittlegate, for three weeks, to practice for the Display came in June 1926; and, while the squadron received commendation from high places on its performance, the diary records the words of a newspaper correspondent, "it was all very pretty but not very new." The squadron, too, was becoming tired of its war-time flying equipment, which was old in years and short in numbers.

The first Fairey IIIFs—three-seaters with Napier Lion VB engines—arrived from Henlow and the Fleet Air Arm at Gosport in December and January 1928. The two distinct types, under serial letters J and S, can be seen in the photograph on page 489, taken by the author in 1928. With the new aircraft No. 207 forsook their old companions in the R.A.F. Display and practised wing formations with Nos. 11 and 12 Squadrons at Andover.

In December 1928 came another change of command. S/L. Graham, promoted to wing commander, left to command Tangmere, where No. 1 and 43 Squadrons were stationed. S/L. E. A. Beaulah came from H.Q. Air Defence of Great Britain (now Fighter Command) to take over No. 207. Normal peace-time training continued throughout 1929, but it is interesting to read a comment in the squadron diary regarding the affiliation exercises held that year with No. 19 Squadron. "The exercises," it says, "again showed the fighter aircraft not to have sufficient superiority of speed over the fast day-bomber." The IIIFs had a top speed of 140 m.p.h. and No. 19 Squadron's Siskins a maximum of about 150 m.p.h.!

The ship target for 1929 was the *Centurion*, and from September 9th to 11th the squadron—together with a special composite flight of No. 7 Squadron—took part in the bombing trials under the command of G/C. J. T. Cull, D.S.O., who, in 1916 had cam-

On Turkish soil: One of the squadron's D.H.9As with long-range tanks does a little exhibition bombing to impress the local populace.

S/L. A. W. Tedder, later to become Chief of the Air Staff, with one of his flight commanders at San Stephano airfield, Constantinople, in 1922.

paigned with the No. 7 Squadron, R.N.A.S., operating in East Africa. The bombing results were very good—of 156 bombs dropped no fewer than 29 hit the *Centurion*. Despite this accurate bombing the squadron could not do better than get placed sixth in the Lawrence Minot Trophy contest. It was, however, second among the day-bomber squadrons.

As was usual in those days, the end of annual training brought the leave period, and while this was in progress in 1929 the IIIFs were all fitted with Handley Page automatic slots. On return from leave the unit moved to Bircham Newton.

Yet another change of command came in 1931: S/L. Beaulah was posted to H.Q. Wessex Bombing Area and was succeeded by S/L. J. W. Woodhouse, D.S.O., M.C., who came from No. 55 Squadron in Iraq.

In August of 1932 the IIIFs were taken to practice camp for the last time before being replaced by Fairey Gordons. With the IIIFs the following squadron records were made: *Bombing* from 6,000ft, 37.7 yd; from 10,000ft, 43 yd; from 14,000ft, 37.7 yd. *Air Firing*: Best front gun score, 98.5 per cent; crew test, 77.5

Knee-deep. The appalling conditions on the airfield at San Stephano during the winter of 1922. The hangar has given up an unequal struggle.

Even in fine weather, servicing conditions at Constantinople were bad. Canvas hangars with earth floors provided the only cover available.

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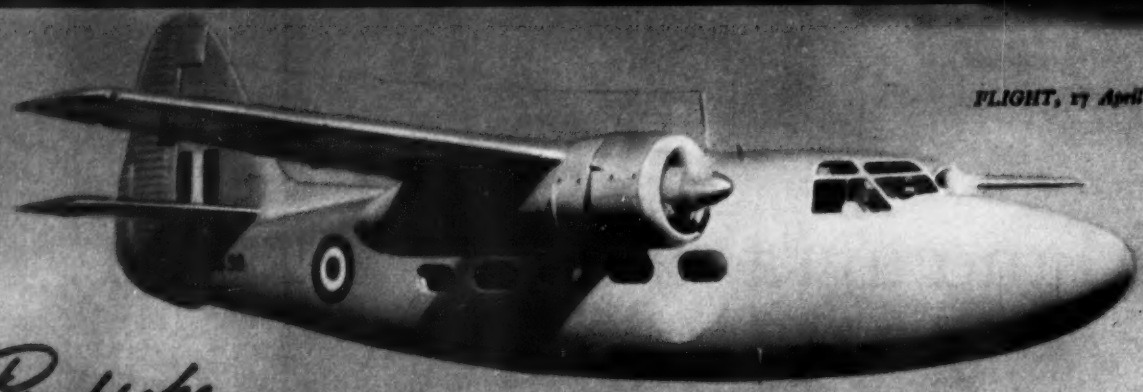

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Provost

"Flight" photograph

For the set piece. Nine Acks of No. 207 Squadron taking off at the R.A.F. Pageant in 1924. They were to bomb the "ships" seen in the background.

No. 207 Squadron . . .

per cent; and rear-gun ground target and towed target, 62 and 92 per cent respectively.

In January 1933, S/L. J. L. Vachell, M.C., came from the Staff College to take over from S/L. J. W. Woodhouse who, with the rank of wing commander, went to command the practice camp at North Coates Fitties. Vachell did not remain long with the unit, for he was replaced by S/L. G. Dawson in September of the same year, but in November, F/L. Wright took over temporary command while the C.O. went to C.F.S. to attend the new "Instrument Flying Course"—the beginning of blind flying. An Avro 504 N with hood over the rear cockpit was allotted to the squadron from C.F.S. for training new pilots in this new-fangled technique.

In 1935, with trouble brewing in Abyssinia, the squadron again went overseas, this time to Ed Damer in the Sudan, where it shared a mess with No. 35 Squadron. The aircraft were taken to an emergency airfield at Port Sudan, where they were erected and later flown to Ed Damer.

From the beginning of November, 1935, until the end of the following March the squadron was employed in siting and preparing advanced landing grounds and bomb dumps, and maintainng a daily air mail service between Ed Damer, Kassala and Khartoum. Some of the advanced landing grounds were as far distant as 300 miles. The Fairey Gordons had a pretty bad time. They were picketed in the open, and the engines suffered much from sand-storms, the grit causing excessive wear and considerable increases in oil consumption.

At the end of March 1936, S/L. Rodwell left the unit owing to ill-health and was replaced by S/L. J. W. Lissett. In addition to the change in command the unit moved to Gebeit (about 60 miles west of Port Sudan and some 2,600ft above sea level) and changed its Fairey Gordons for Vickers Vincents. These, however, were held for only a short while. In July the Vincents were handed over to No. 47 (B) Squadron and that unit's Fairey Gordons were taken in exchange. Gebeit was also the scene of the presentation of the Squadron badge by G/C. R. Collishaw. The badge is one of the very few signed by King Edward VIII before he abdicated.

August 1936, saw No. 207 on its way back to England in company with Nos. 3, 12, 35 and 41 Squadrons. It was posted to Worthy Down as part of No. 2 Group and re-formed on a two-flight basis.

With the expansion of the R.A.F.—which was then in full swing because of the international situation—a number of new pilots direct from F.T.S.s were being sent to the squadron. None of them had ever flown a Gordon, and there were no dual-control Gordons available for instruction. However, with ground instruction, passenger flights and taxying practice, all managed to convert without breaking any aircraft. It was about this time, also, that No. 207 initiated the use of photography for practice bombing in place of the old camera-obscura method. It was so successful that the idea was promptly seized upon by Bomber Command.

An interesting feature of the training in 1937 was the increase in night flying demanded of the single-engined "day" bombers. The chief reason was the reclassification of bombers from "day" and "night" bombers into light, medium and heavy categories.

In September 1937, the Gordons were replaced by Vickers Wellesleys. The first was collected from Brooklands on the last day of August. In view of the complicated nature of the aircraft (Washingtons) which the squadron now flies it is interesting to read in the diary: "As the new aircraft are fitted with modern contrivances such as variable-pitch airscrews, retractable under-carriages, hydraulically-operated flaps and air-pressure brakes, the pilots are given printed cards to refer to, so that they will remember the sequence of operations." Thus was cockpit drill born.

The beginning of 1938—Munich year—saw the squadron working-up very hard. Flights of over five hours were made, and practice bombing carried out from 10,000, 15,000 and 20,000ft to ascertain the limits of visibility from the bomb-aimer's position in the Wellesley. On one of the long-range trips to Durham a Wellesley was lost in a forced landing. Considerable trouble was experienced with the aircraft emptying one wing tank before the other and developing an air-lock in the fuel system.

In April 1938, came another double change. The squadron moved to Cottesmore, in Rutland, and was re-equipped with Battles, thus going back to Fairey aircraft once more. The Wellesleys went to the Middle East, where their long-range capabilities were more appreciated.

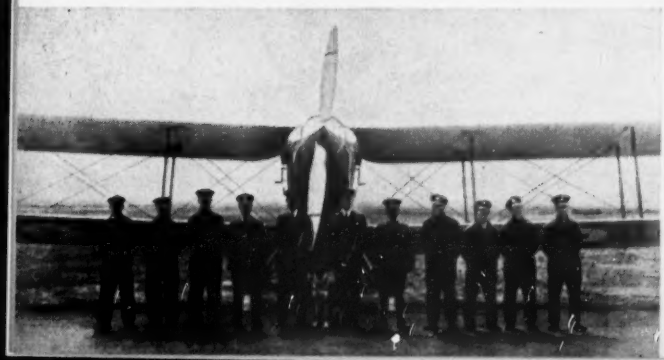
In August, S/L. J. N. D. Anderson was posted to command No. 207 in place of S/L. Lissett, who went to Training Command H.Q. In September came the Munich crisis. All leave was stopped and key personnel recalled. The squadron mobilization scheme required everything and everybody to be ready to move at one day's notice.

With Hitler's suave promises, conveyed by Mr. Chamberlain as "peace in our time," the excitement died down and the squadron was notified that it was no longer regarded as an emergency squadron. The Battle 1s with Merlin 1s were changed for Battle 1s with Merlin 2s, and normal training proceeded.

At the outbreak of war in September, 1939, the squadron was scarcely an operational unit. It had moved from Cottesmore to Cranfield and was, to all intents and purposes, a unit for training pilots, air observers and wireless operator/air gunners. A number of aircraft and crews were posted away to bring other squadrons up to war strength. These were soon replaced and the early part of the "phoney war" period was spent as an O.T.U., with a move back to Cottesmore because of airfield unserviceability at Cranfield. In April the squadron was absorbed into No. 12 Operational Training Unit and later became once more a separate entity—at Waddington, in November 1940, as part of No. 5 Group. W/C. N. C. Hyde was in command, and the aircraft on strength were Avro Manchesters with Rolls-Royce Vulture 2 engines.

Certain difficulties with both engines and airframes owing to hurried wartime production caused a lot of unserviceability. Six of the Manchesters were detailed for intensive flying until 500

Flight Commander F/L. W. Elliott, D.F.C. (with dog), in front of his Fairey IIIF in 1928. He later became A.O.C-in-C. Fighter Command.

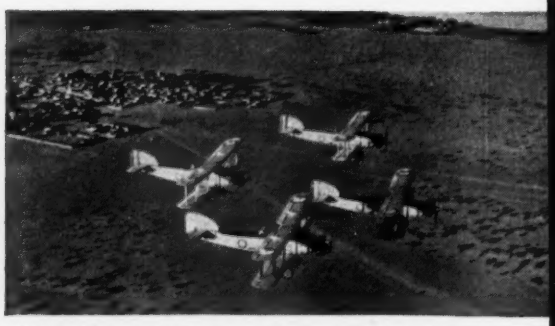


Practising for the R.A.F. Display, 1928. The tails show the differences between the IIIFs from the R.A.F. and those from the Fleet Air Arm.

"Flight" photographs

"Flight" photograph

Squadron pilots in 1933. The Commanding Officer, S/L. J. L. Vachell, M.C., is fifth from the left. Next is F/L. Crummy—now Group Captain commanding Wilmslow.



"A" Flight Gordons flying over Ed Damer in the Sudan during the Italo-Abyssinian troubles in 1936.

No. 207 Squadron . . .

hours were completed. By January 1941, it was felt that restricted operational flying could start, and four aircraft were kept available, while major modifications were made to the others. The King and Queen visited the station and distributed a number of well earned decorations to aircrews.

A nucleus was withdrawn from 207 to form No. 97 (Straits Settlements) Sqn. This depletion, and bad weather, combined with further unserviceability to keep the unit from doing much operational flying; but on February 24th, 1941, six Manchesters individually bombed a *Hipper*-class cruiser in Brest harbour. All six returned safely, but one made a wheels-up landing on return.

Hydraulic systems were now giving trouble, and operations were few and far between. Usually only two Manchesters, or four at the most, were called for operations, but on March 13th, although required to find only two aircraft, the squadron managed to produce no fewer than five for a raid on Hamburg. One of these, L7913, captained by F/O. Matthews, D.F.C., was late in taking off, owing to a burst tailwheel tyre. This Manchester was intercepted by a German intruder five miles from Waddington and shot down in flames; only one member of the crew, Sgt. Cox, survived.

By April, No. 207 were producing as many as eight Manchesters for a raid, but the squadron took a knock when the C.O. (W/C. Hyde) and his crew failed to return from an attack on the shipyards at Kiel; later, however, they were known all to be safe as P.o.W s. W/C. J. N. Anderson, O.B.E., took over the unit, but relinquished his command at the beginning of May.

A noteworthy entry appears in the squadron diary for April 9th: While *en route* to attack Bremen and Vegesach the crews dropped small packages of tea over Leeuwarden and Gronigen in Holland.

Unserviceability persisted, and although new aircraft, modified to take 4,000 lb bombs, were arriving, on April 13th all Manchesters were again grounded pending an investigation into bearing trouble. A little local test flying was done but, generally speaking, only ground training was possible until the beginning of May.

At last, on May 17th, orders were received that until further notice Manchesters were not to be used for operational flying. Training flying continued, with a high proportion of engine failures.

Back on operations at the end of June, eight Manchesters were ordered to attack Boulogne. Seven were airborne and four successfully attacked the target. One Manchester attacked the "last-resort" target and another returned to base owing to the inadvertent release of his parachute by the front gunner. The aircraft that attacked the last-resort target landed at Biggin Hill with its starboard engine on fire. On the same day another machine was lost, apparently due to engine failure after take-off. Next day it was learned that the missing aircraft had been shot down by a Beaufighter over Wollaston, Northants, while it was outward bound on track at 6,000ft. At the end of June all Manchesters were again grounded, with the exception of one which had new engines installed and which was ordered to complete 240 hours in the air as soon as possible. This feat was achieved at the rate of 15 hours a day by three crews, with servicing done overnight. Each trip included a climb to 17,000ft. At the end of the test run the engines were removed and sent back to the manufacturers.

By now No. 207 had been partially re-equipped with Hampdens and flew with No. 44 Squadron on operations, many of which were "Gardening" (the code-word for sea-mining) sorties. "Eglantines," "nectarines," "artichokes" and "geraniums" were all planted successfully.

Early in August 1941, the Manchesters were back on operations

"Flight" photograph

Fairey Gordons in squadron formation over East Anglia in 1933. Photographed by the author from the wing aircraft of "C" Flight.

yet again, and mixed forces were sent out. On the first operation there was trouble again with the Manchesters—this time it was tail flutter. "Bill" Thorn, Avro's test pilot, came to Waddington to make a climb with full load. It was found that the tail buffetting was caused by climbing the aircraft too near the stall.

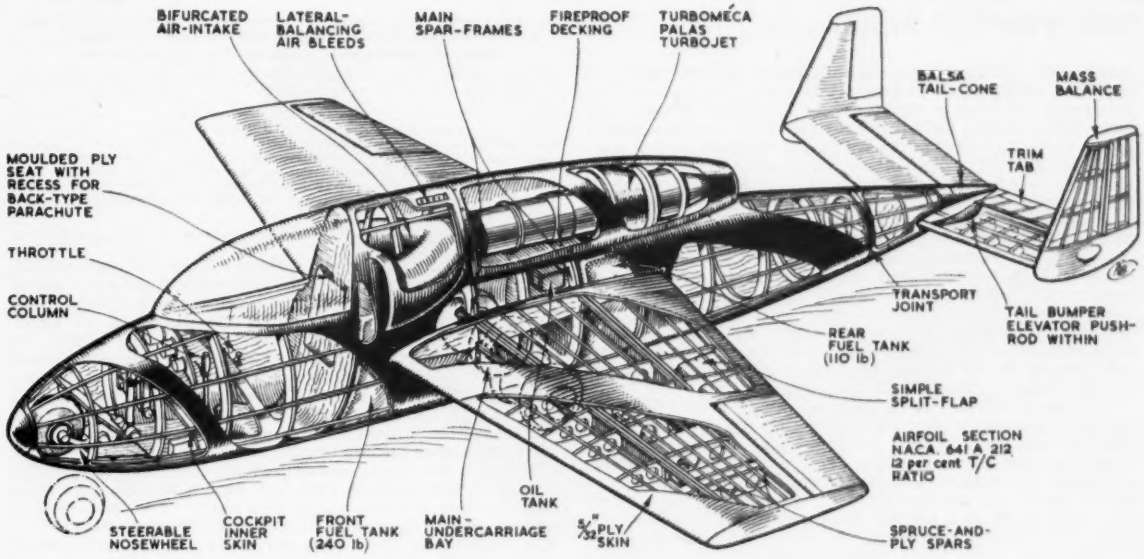
One Manchester was very lucky to get back from Berlin. At 18,000ft over the target it was hit in the port engine by flak and all the coolant lost. The damaged engine was switched off and the airscrew feathered. Avoiding action was taken as the Manchester made its way back to base, flying at only 5,000ft through the searchlight belt. At this height the aircraft was icing up and, since it could go no higher, had to come lower still. All auxiliary equipment—including the dinghy—was jettisoned and a safe landing was made at West Raynham despite one tyre having been shot through.

At last the Manchesters seem to have decided to behave themselves, for in October the diary tells of 12 and 14 being detailed for long-distance trips on "Gardening" operations in the Baltic.

(To be concluded)

Not fighter affiliation but a No. 207 Manchester passing across the tail of a No. 44 Squadron Hampden over Waddington in November, 1941.

"Flight" photograph



THE WINNING RACER

Boscombe Down's Entry in the Royal Aero Club Design Competition

IN our issue of April 3rd we gave preliminary details of the winning designs in the Royal Aero Club's recent aircraft-design competition. These were amplified last week with a more detailed discussion of the first-prize-winning two-seater, and it is now the turn of the top-ranking single-seat racer.

As related on April 3rd, this design was prepared by a syndicate formed at the Aeroplane and Armament Experimental Establishment of the Ministry of Supply, at Boscombe Down, Wiltshire. The chairman of the syndicate was A. Cdre. A. H. Wheeler, director of the A. and A.E.E., and the chief designer, Mr. F. Handel Davies. Other members of the syndicate were listed on page 420 of our April 3rd issue.

Initially, the syndicate's studies tended towards rather bizarre and unconventional designs—some with prone pilots—but, as the work progressed, the general configuration became less unorthodox. One of the first steps was to consider all possible types of configuration using each of the specified power plants—the Blackburn Cirrus Minor and the Turboméca Palas turbojet. On the score of performance the Palas was chosen, and interest then centred upon the merits of the various relative positions of the engine, pilot and fuel tanks.

Studies with an "average airman" (A.P.970 spec.) made in celluloid showed that the human body could be taken as the factor governing fuselage cross-section. This implied that a dorsally-mounted engine involved no increase in frontal area and this layout was, eventually, adopted. A rear-fuselage engine position would have introduced severe intake losses.

Much consideration was needed before the decision was taken to employ the simplest and most efficient wing possible, relegating fuel and undercarriage to the spaces left under the engine in the fuselage proper. By this means a very light wing (110 lb) was designed, with the cleanest possible surface.

Airframe studies embraced all forms of metal, wood and plastic structures—with a particularly close look at what could be done with Durestos and similar resin-bonded fibres. The dictating factor was the fact that the design was for a one-off aircraft—or, at the most, for very limited production. This weighed heavily in favour of wood and such construction was chosen, with—it is claimed—gains in weight, cost and surface finish. The design is described in greater detail below.

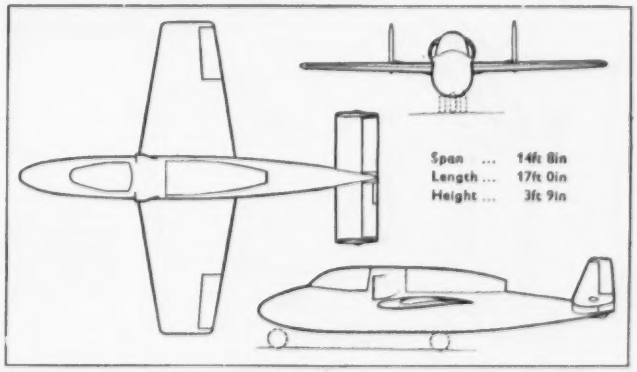
Wings.—Great emphasis was placed upon the simplest possible structure, and to this end the wing has been designed to provide lift only and not to act as a housing for fuel tanks or landing gear. Construction, which is entirely in wood, is illustrated in the cross-sectional and perspective sketches on pages 492-3. Two spars are used, each having spruce booms and birch ply webs. The ribs, which are not continuous through the spars, are simple plywood webs with lightening holes. The spanwise stringers are of spruce, and the wing is skinned with 5/32in ply, bias-cut for torsional rigidity. The root attachment to the fuselage is through metal fishplates with four and three bolts on the main and rear spars, respectively. Two wing-root fixing bolts are also provided at the front and rear of the end-rib to bring the wing tightly against the fuselage.

Fuselage.—The structure was designed to have the minimum cross-sectional area consistent with the provision of a comfortable cockpit in which a pilot could maintain efficient control of the aircraft in a race. All-wood construction was again chosen and, as an aid to manufacture and maintenance, the fuselage is designed in three separate sections, which will be considered separately.

The Nose Section is built up of light spruce frames and stringers and contains the box structure housing the nose-wheel and the cockpit. Double ply skinning is specified around the cockpit; this not only adds torsional rigidity and provides a smooth surface over the cockpit interior, but also enables the engine (and other) control-boxes to be securely attached to wood blocks mounted between the double skins. The pilot's back-rest is integral with the airframe, as is the small floor upon which his heels rest. The nose section has a strong keel and continuous longitudinal stringers, so providing maximum protection in the event of a wheels-up landing.

A blown Perspex canopy is specified, mounted on a light framework dowelled to engage in the bulkhead behind the pilot. At the front of the canopy is a single release lever for complete emergency-jettisoning of the canopy. For normal entry and exit the canopy is lifted clear of the airframe, as in many modern sailplanes; an advantage is the accessibility to instruments and controls thereby gained. At the rear end of the nose-fuselage a massive main frame—of spruce members with ply on each side—serves as a crash pylon.

The Fuselage Centre-section houses the engine, fuel tanks and main undercarriage, and its general construction follows that of the



Following the pattern set by Heinkel's "Volksjager" in 1944, the Boscombe Down Racer has a span of but 14ft 8in.

THE WINNING RACER . . .

nose section. At the forward end, adjacent to the main frame just described, is a light spruce bulkhead with plywood facings, to which is attached a firewall of asbestos sheet sandwiched between two metal skins. Strong frames are provided at the wing-attachment points which also serve as cradles for the considerable fuel load.

In order that the rigid fuel tanks may be removed for inspection, the belly of the fuselage is formed from detachable plywood shells on light spruce frames edged with a metal beading. Through this beading countersunk bolts and anchor nuts provide attachment to fittings on the main frames and longitudinal stringers. The tanks themselves are secured by straps to the principal longitudinal stringers—which are situated approximately at the maximum beam of the fuselage above the wing—and transfer the tank loads to the frames. Above the tank-bay a stainless-steel or light-alloy diaphragm runs across the fuselage between the principal stringers; its chief function is to serve as a floor for the engine bay, but it is also virtually the top covering of the fuselage from the firewall to the rear end of the second tank.

The engine itself has three mounting points, two on the lower half of the compressor inlet casing, and one at the rear on the lower flange of the centre casing. Each attachment has a Silentbloc mounting through which passes a bolt to the engine supporting members. The engine is aspirated through "elephant-ear" intakes which connect by a breeches-piece to the flange of the air inlet, the joint between the duct and the engine being secured by a locking ring. The engine is cowled beneath two removable stainless-steel or light-alloy shells which, with the metal trough previously mentioned, form a fireproof surround to the engine bay.

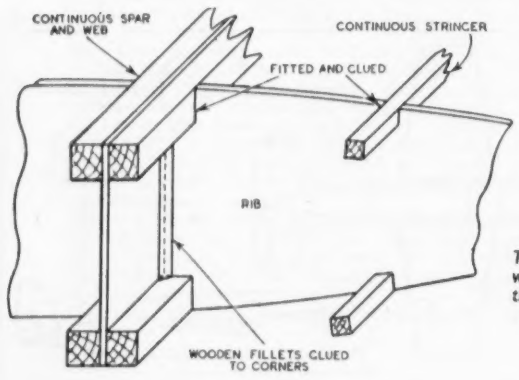
The wing-root fillets are integral with the fuselage structure, leaving a clear line for the leading and trailing edges of the wing itself. This not only simplifies construction, but also makes for a readily transportable wing when the machine is dismantled. Near the mainspar fittings an area of fuselage is left unskinned to enable the machine to be rigged before final attachment of the wing-root fittings to the bulkheads. Rigging is further assisted by the fact that the stub wing lies entirely outside the fuselage section, and skinning of the fillets does not affect the fuselage; it also obviates the necessity of providing a costly alignment jig. At the rear of the centre section a small coverplate provides access to the transport joint between the centre fuselage and the tailcone.

Rear Fuselage and Tail. The rear fuselage consists of a simple cone formed from ply bulkheads and spruce stringers with plywood skin, the final tip being of balsa wood. Two plywood bulkheads in the tailcone are continued outwards to form the simple ply webs of the two spars of the untapered tailplane. These spars have spruce booms and tailplane construction generally follows that of the wings, with ply webs and skin. At the outer ends of the tailplane are attached the two fins; both fins are vertical, although the tailplane has ten degrees dihedral for ground clearance.

Undercarriage.—As previously mentioned, the designers were loath to adopt a wing-mounted undercarriage if it could possibly be avoided. Retraction of the main legs into the fuselage necessarily involved severe reduction of track, but not, according to calculations, to a degree likely to cause trouble or to disqualify the design on the grounds of lateral instability during cross-wind taxying or landing.

After examining the possibilities inherent in the use of a single mainwheel mounted on the centre line, it was decided to adopt the system shown in the drawing on page 491. Two mainwheels are used, one being carried on each leg of an oleo fork member, the upper end of which is attached to a cross-bar held rigidly between the two main fuselage bulkheads. Shock absorption is obtained by leading the oil from each leg into a common dashpot, where the reaction is taken by a coil spring. In spite of the fine-tolerance manufacture required, this arrangement was considered preferable to a simple spring, bungee, or rubber-block affair.

The nosewheel is of the same size as the mainwheels—11in diameter by 3.9in width—a tyre of this size being considered sufficient for shock absorption without the use of a telescopic leg. The wheel is mounted in a tubular fork member, the upper arm of which is held in a substantial plain bearing mounted on a tubular cross-shaft attached in turn to bearers running parallel to the keel. Vertical loads are absorbed by a thrust bearing placed between the head of the fork and the cross-shaft fitting. At the top of the fork assembly is a small tongue engaging with a grooved member in a torque tube mounted vertically between the rudder pedals. A sprocket carried at the upper end of the torque tube is chain-driven from the rudder pedals, the gear ratio being such that full pedal movement imparts 40-deg rotation to the nose leg.



This detail of the wing is typical of the simple structure adopted.

BOSCOMBE DOWN SINGLE-SEAT RACING AIRCRAFT

Turboméca Palas, max. thrust 300 lb (max. cont., 265 lb)

General Data.—Span, 14ft 8in; length, 17ft; height, 3ft 9in; gross wing area, 55sq ft; empty weight, 532 lb; gross weight, 1,094 lb; wing loading, 20 lb/sq ft; stalling speeds (no flap, $C_1=1.3$), 78 m.p.h.; (60 deg flap, $C_1=1.8$), 66 m.p.h.; max. speed at 950 lb wt. at sea level, 370 m.p.h. (combat power, used for racing) or 320 m.p.h. (max. cont. power); design diving speed, 460 m.p.h.; loiter speed (max. endurance with adequate control), 177 m.p.h. Performance in a 200-mile race at sea-level (assuming 350 lb kerosine with 10 lb used for take-off): Race can be flown at combat power (370 m.p.h.), giving after-race loitering endurance of 35 min, or at max continuous power (320 m.p.h.) giving loiter for 55 min. Take-off and landing over 50ft screen, 490 and 360 yd; best rate of climb at 190 kt at combat power, 3,000ft/min.

The rudder pedals hang beneath a bar pivoted about a vertical axis through its mid-point. From this bar, cables lead to the rear fuselage, where they actuate a horizontal T-piece pivoted about a vertical axis. The central member of the T points to the rear and, through a ball joint, actuates push-pull rods running along the front of the tailplane rear spar. These rods drive the rudder *via* crank arms housed in small blisters in the sides of the fins.

The port elevator carries a simple trim-tab actuated by Teleflex cable. The designers state that they had considered incorporating a knurled trim-control knob at the top of the control column.

Simple split flaps are fitted, manually operated from a push-pull pistol-grip beneath the instrument panel: the gated positions are: flaps up, take-off setting at 20 deg. and landing setting at 60 deg.

A typical instrument-panel layout is shown in a small sketch on page 493. The directional gyro could be replaced if desired by an oil-temperature gauge, the other instruments being re-arranged

Both nose and main undercarriage units are retracted by means of a hand-gear operated from the cockpit through an endless Bowden cable to a worm-gear drive-shaft. The worm gearing actuates toothed quadrants mounted on the cross-members of both nose and main undercarriages, and provides an irreversible action which provides positive locking in any position. The untoothed ends of the quadrant provide up and down stops, and a cockpit undercarriage position indicator is provided actuated by a mechanical linkage.

A twin-shoe expanding brake assembly is fitted to each mainwheel and is directly operated from the cockpit by cables; the cable from each brake is attached to a common yoke, thus ensuring equal braking on both mainwheels.

Fuel System.—The Turboméca Palas turbojet runs on kerosine, carried beneath the engine bay in light-alloy tanks. These are so arranged that, as fuel is consumed, the c.g. of the aircraft moves only very slightly. The tanks are pressurized to 2 lb/sq in by air which, tapped from the compressor of the engine, forces the kerosine into a common collector-pipe connected to the engine fuel inlet. Inside each tank is a weighted flexible extension to the fuel outlet so that, in inverted flight, the mouth of the feed pipes remains beneath the surface of the fuel. The tanks are filled from refuelling points on each side of the fuselage, and may be drained from a cock in the common pipe. Petrol is used for engine-starting.

The high-pressure fuel cock is incorporated in the throttle movement, and a three-position low-pressure cock—"petrol," "kerosine," and "off"—is situated beneath the fuel tanks and connected by a Teleflex control to a lever on the cockpit floor.

Controls and Instruments.—The control column is connected to a fore-and-aft torque tube running along the cockpit floor, and the aileron cables run under the floor and pilot's seat to a pair of pulleys at the bottom of the main bulkhead. From here, the cables lead to another pair of pulleys attached to the same bulkhead above the top of the main fuel tank; the two cables then meet at a single pulley mounted on a vertical axis on the centre line of the aircraft immediately behind the line of the main spar. This pulley is mounted on the same shaft as a crank arm which imparts a reciprocating motion to a push-pull rod mounted in either wing; these rods effect the final drive to the ailerons *via* both cranks and chordwise push-pull rods which, in order to allow sufficient aileron movement, protrude beneath the wing in faired blisters.

The elevator cables run from the bottom of the control column over a number of pulleys to the rear fuselage, where they are connected to each end of a short vertical bar pivoted at its mid-point about a transverse axis. The lower end of this bar is also attached through a ball joint to a push-pull rod which actuates the elevators through a crank arm. In order to permit full elevator movement, the push-pull rod and crank arm project through the bottom of the rear fuselage and are housed in a tail bumper fairing.

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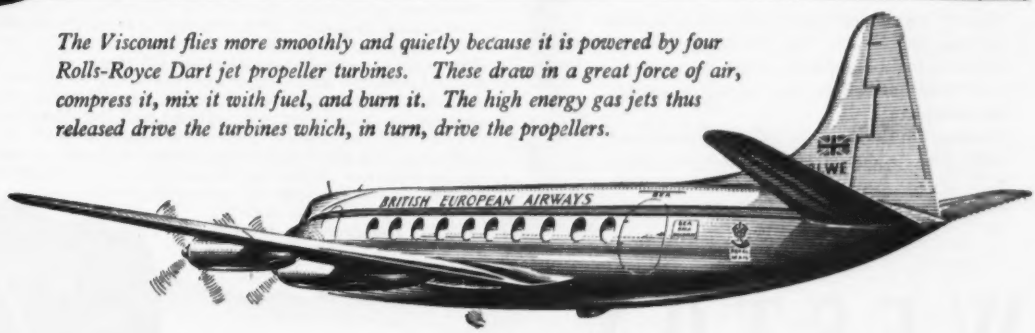
by VISCOUNT to Zurich, Geneva, Rome, Athens, Istanbul, or Cyprus.

To fly aboard BEA's pressurized, turbo-prop VISCOUNT (BEA 'Discovery' Class) is a wonderful experience. The perfect ease of its flight, the stillness, the smoothness, the feeling at the end of the longest journey of quiet and restfulness—all this is altogether new.

The Viscount flies more smoothly and quietly because it is powered by four Rolls-Royce Dart jet propeller turbines. These draw in a great force of air, compress it, mix it with fuel, and burn it. The high energy gas jets thus released drive the turbines which, in turn, drive the propellers.



VISCOUNT

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A drawbar pull of 3800 lb. enables the David Brown Taskmaster to handle aircraft up to the Convair, Viking, and Dakota class with ease and safety. The 4-speed gearbox with its low-ratio 1st gear equips the driver for full-power 'break-out' with easy under-way gear-shift to suitable working speed. The David Brown Taskmaster speeds up ground movement, lowers fuel costs, and although primarily designed for aircraft handling it can turn its hand to every conceivable haulage job around the airfield.

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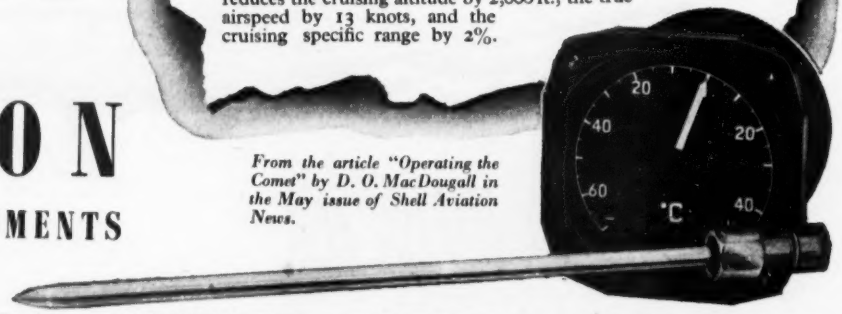
ACCURATE INDICATION OF AIR TEMPERATURE GOVERNS THE WHOLE ECONOMY OF OPERATION

Weston Thermometry has been chosen for several applications on the De Havilland 'Comet' including fuel temperature, cabin air temperature, wing and tail de-icing as well as outside air temperature.
Illustrated is the Model S.110G/9 Thermometer Bulb with its associated Indicator, the Model S.63 circular scale Ratiometer used for outside air temperatures.

Flight Planning The air temperature is one of the most important factors in the operation of a long-range jet aircraft as it influences the rate of climb, the heights at which the aircraft will cruise, and hence the true airspeed. The latter in turn determines the specific range (air miles per pound of fuel) since within limits, fuel consumption per hour at the normal cruising altitudes does not vary much. It can be seen therefore that air temperature controls the choice of flight path, largely determines the fuel load carried, and governs the whole economy of the operation. The effect of air temperature on Comet operations can be illustrated by the fact that a 10°C. rise in temperature reduces the cruising altitude by 2,000 ft., the true airspeed by 13 knots, and the cruising specific range by 2%.

From the article "Operating the Comet" by D. O. MacDougall in the May issue of Shell Aviation News.



WESTON
AIRCRAFT INSTRUMENTS

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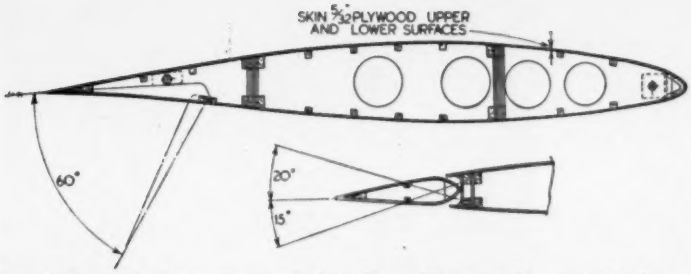
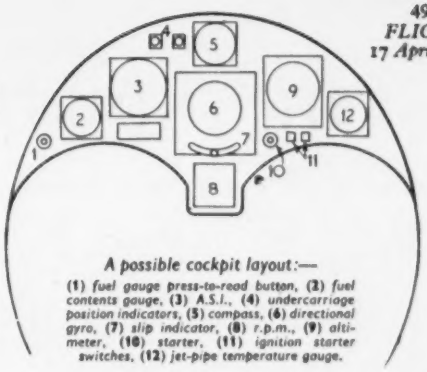
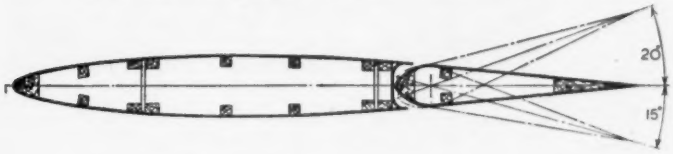


A cross-section through the wing in way of the flaps and (inset, on the same scale) the ailerons. The ailerons are flat-surfaced with an elliptical nose and a hinge-line inset 20 per cent. Like the flaps, they are under direct manual control.



A possible cockpit layout:—
(1) fuel gauge press-to-read button, (2) fuel contents gauge, (3) A.S.I., (4) undercarriage position indicators, (5) compass, (6) directional gyro, (7) slip indicator, (8) r.p.m., (9) altimeter, (10) starter, (11) ignition starter switches, (12) jet-pipe temperature gauge.



(Left) This tailplane/elevator section shows the inset elevator hinge with balance weights along the leading edge. Elevator tab-angles are plus or minus 15 deg.

THE WINNING RACER . . .

accordingly. Instruments specified are as follow: air-speed indicator, Kelvin and Hughes KB 215/04, reading from 50 to 490 kt (the pitot head being in the tip of the nose of the aircraft); altimeter, Type KB 01/01, reading from 0 to 40,000ft (like the A.S.I., this is a simple instrument, a sensitive indicator not being considered worth the additional expenditure entailed); compass, KB 411/01 (a small dashboard-mounted instrument); engine speed indicator, Type KB 113/01; oil-pressure gauge, Smiths VI 62; jet-pipe-temperature gauge Type Western S.64 small; and fuel contents gauge, Smiths Desynn type.

Lateral Stability.—The designers are well aware of the shortcomings of a wheel track no greater than 1ft. Their calculations showed that, with the arrangement chosen, the aircraft would be laterally stable during normal take-off and landing runs. On the other hand, ground manoeuvring in cross-winds, particularly over rough ground, would be likely to roll the aircraft on to a wing-tip. To meet this case, a novel lateral balancing system has been evolved, consisting of a compressed-air bleed tapped from the engine to a two-way variable-flow rotary valve interconnected—when the aircraft is on the ground—through a safety linkage to the ailerons. From the valve, short pipes lead to horizontal nozzles mounted as high as possible on either side of the fuselage.

Bleeding ten per cent of the total engine airflow is calculated to provide a lateral thrust of about 27 lb, giving a righting moment more than sufficient to counteract a 20-kt cross-wind. When these lateral balancing bleeds are in action, a throttle-stop will be necessary in order to prevent excessive jet-pipe temperature.

Costing.—As previously related, wood was adopted to keep costs within reasonable bounds, and much of the performance expected was achieved by the choice of a very small, clean airframe. On a "one-off" basis, the cost is calculated as £4,600, of which £3,800 is for the engine.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

The Old Service Tie

THERE seem to be more club and colour ties, in addition to the genuine old-school and regiment varieties, than ever before, and yet I have been wondering if one important one is not still missing. The old boys of the R.F.C. proudly sport their colours, and the serving R.A.F. have their version of the red, white and blue, but what of the enormous band of ex-wartime R.A.F.? Some are still in the V.R., but they are being retired, and the V.R. itself is apparently folding up. Others still wear the R.A.F. tie to which they are not strictly entitled. Squadron and even command ties are too obscure and are not usually recognisable as such except to members. Much the same is true of the Reserve Club ties and the red Pathfinder tie, which look after a few more of our band. But there still remain the thousands of old pilots—they are to be found all over the world—who will have nothing in the tie line to show to their grandchildren in 1970-80.

It seems to me that we want an ex-R.A.F. tie for all—to take the honoured place of the R.F.C. tie in a later generation. And perhaps it could be in the colours of the "Spam ribbon" or continue the attractive R.F.C. tie itself, with some small addition or alteration woven in.

London, S.W.19. SLIPKNOT.

"Weapons of Air Defence"

I MAY be the victim of a leg-pull in attempting the reply to "Viking's" letter (March 27th). However, the temptation is irresistible.

Without digressing on the tactical horrors of "Viking's" scheme, may I ask how he proposes to solve the technical problems of developing such a helicopter as he envisages? Assuming that such a machine *can* be radio controlled, which is most doubtful, how does he intend to launch missiles from it above the horizontal plane? Where does he propose to install the radar, which would need search ranges considerably in excess of the range of the missile carried?

Such a machine could hardly fail to weigh 100,000 lb or more, and would take at least 20 years to develop. Research would be required into at least three major problems, and let us not forget that even the quickest missile itself is still only in its infancy. As for the "self-firing" rockets in defence, I wonder how the average pilot would feel at night over the English Channel, dodging helicopters and their "self-firing" rockets because his own "electronic device" is u/s and has failed to do its stuff.

Perhaps it would be wise to remind "Viking" that the rockets in the Starfire are far from being self-launching. They are eventually fired after a long and complicated procedure involving stupendous ground organization, the most modern airborne equipment and the supervision of a highly-trained crew. Similarly, the launching of a missile from ground or air can only be the last stage in the same essential process. Is all this to be done by one unmanned helicopter? Perhaps "Viking" *is* pulling our legs, after all?

Plymouth. ANCIENT BRITON.

T.V. Film Identifications

THE flying-boat which your correspondent "M.G." (March 20th) saw in the film *Victory at Sea* was a Martin PBM-5 Mariner. The Mariner and Marlin are easily distinguished, the former having a "butterfly" tailplane with twin fins and rudders and also a radar mounting on the fuselage between the engines. The Marlin has only a single fin and rudder, and radar in the nose.

Alloway, Ayr. MICHAEL C. BACON.

Not so Simple

I READ with great interest your experiences with the Viscount "In the Air" (March 20th). Modern airliners seem to be bags of tricks to the *nth* degree, but, all the same it wasn't quite so easy in the old A.T.A. days as you suggest (". . . an A.T.A. pilot could carry a notebook—with scarcely a bulge in his tunic pocket—that contained all he was required to know in order to ferry any service aircraft that might come his way").

Quite a big White Book had to be taken and studied for any *new* aircraft, and it was only the Blue Book of condensed refresher knowledge which made that bulge.

Also, on heavy twin and four-engined types a flight engineer was carried, a man supposed to be competent—but, indeed, those were the good old days!

Cambridge. S.K.J.

THE INDUSTRY

Short Bros. Apprentice Prize-giving

OVER 90 apprentices of Short Brothers and Harland, Ltd., received prizes from Mrs. M. S. Slattery, wife of Rear Admiral M. S. Slattery, C.B., F.R.Ae.S., chairman of the company, at the recent annual prize-giving distribution held at Belfast. In addition to an audience of parents and of members of the company, the ceremony was attended by Dr. Eric Ashby, Vice-Chancellor of Queen's University, Belfast, and Shorts' board of directors was represented by Mr. C. P. T. Lipscomb, Mr. R. E. Harvey and Mr. David Keith-Lucas.

Rear Admiral Slattery, speaking at the ceremony, said that of the company's 600 apprentices 400 were indentured, and that during 1952 an additional 200 boys had been admitted to the scheme. It was the hope of the Board that eventually 75 per cent of all the company's employees would be ex-apprentices. Referring to the establishment of the apprentice training school at Castlereagh, near Belfast, Admiral Slattery said that in this school young apprentices were given elementary instruction before working in the production shops.

Mr. F. C. Kirkpatrick, apprentice supervisor, in presenting his report, said that the increase of 200 apprentices in the annual intake represented more than five times the figure of past years. During the year, he said, 35 labour and message boys had received apprenticeship, while 10 works apprentices had been granted indentures.

For Speedier Steward-Service

THOUGH Walters Electrical Manufacturing Co., Ltd., was established as long ago as 1880 its products keep pace with modern requirements, and among them are two items of airliner equipment for which a considerable demand is being experienced.

One is the "Wemco" steward-call system, operating on the illuminated press-button principle. For installation in a flush-fitted panel at any convenient point near each seat-station is a neatly designed button which, when pressed, becomes illuminated and at the same time lights a signal-lamp at the steward's position (a buzzer or bell may also be incorporated). On being guided to the seat by the illuminated button, and having received the passenger's request, the steward presses the button, thus cancelling the light-signal at both ends of the circuit.

The second device is a passenger notice consisting of the usual seat-belt and no-smoking warnings, with, in this instance, a third line which gives "toilet-engaged" advice. The face of the sign can be of the same colour as the surrounding wall-trim, so that it is extremely inconspicuous when not illuminated. The seat-belt and no-smoking notices are under crew-control, while the third sign is actuated automatically from a contact on the latch of the toilet door.

Among aircraft in which these notices are being installed are the B.E.A. Viscounts, which also have the "Wemco" steward-call system. The makers state that among other new aircraft for which the call-system is being supplied are Comets, Britannias and Ambassadors.

Walters Electrical Manufacturing Co., Ltd., have their offices and works at Kensal Road, London, W.10.

The neat passenger-warning notices installed in the B.E.A. Vickers-Armstrongs Viscounts, as they appear when illuminated. As described above, they are made by Walters Electrical Manufacturing Co., Ltd.

AT AN EXHIBITION which accompanied Short Bros. and Harland's apprentice prize-giving, Dr. Eric Ashby (Vice-Chancellor of Queen's University) is shown a Sealand throttle-control by aeronautical engineering apprentice R. J. Andrews. On the left is Mr. D. Keith Lucas, chief designer and director *(See first item in column 1.)*

IN BRIEF

A PRELIMINARY announcement of 1952 trading results for Handley Page, Ltd., shows a profit of £189,938 (1951, £180,410); taxation absorbed a total of £370,915.

* * *

We regret to learn of the death—during a visit to the U.S.A.—of Mr. H. L. Bowen, a technical executive of the valve division of Mullard, Ltd. Mr. Bowen joined the firm in 1927 and was very well known in the radio industry; he was chairman of the technical committee of the British Radio Valve Manufacturers' Association and a member of several committees.

JOINING PLESSEY: Mr. Alfred Blount (left), formerly general manager of Vandervell Products, Ltd., has been appointed a member of the executive board of the Plessey Co., Ltd. Joining the company's administrative establishment is Mr. R. I. Hughes, A.C.I.S., who has been managing director of the Ford Motor Co., of India.

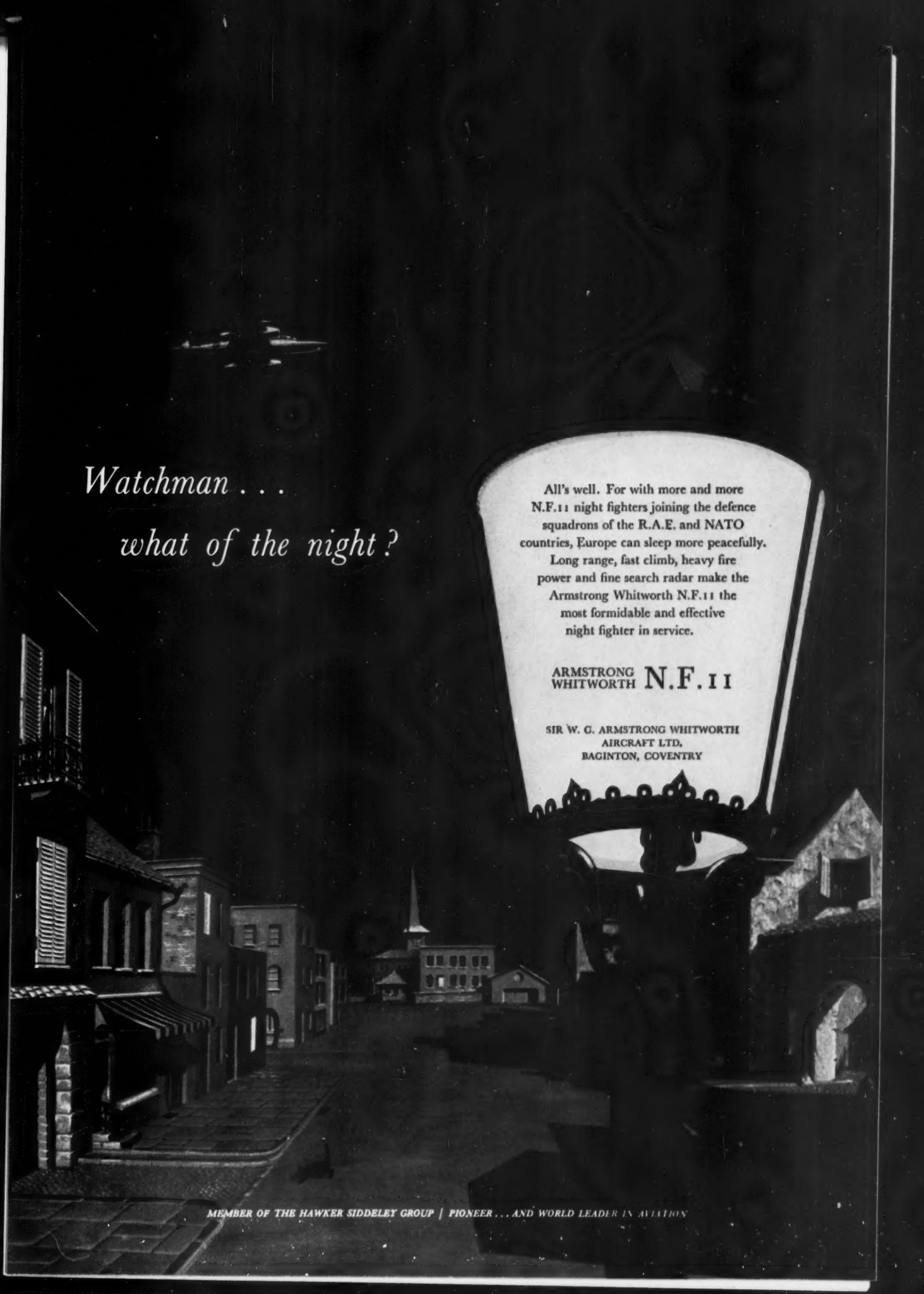
Metalastik, Ltd., state that, since their recent announcement of an agreement for the manufacture of their products in France, a further agreement has been concluded with the Italian concern S.A.G.A.-Pirelli; it provides for an exchange of patents as well as for technical and commercial co-operation in the manufacture of rubber-to-metal bonded components.

* * *

Mr. S. G. ("Stan") Custance, of Fairey Aviation, has retired after 48 years in engineering. He was apprenticed to Vickers, Sons and Maxim in 1905, and remained with Vickers for 28 years, He then spent a year at Woolwich Arsenal, followed by eight months in the inspection department of Western Electric, before joining Fairey's, where his 18 years of service have included duty at Hayes, Stockport and—where he was works manager—Heston.

* * *

In addition to courses for welding operators and for designers and draughtsmen, the Quasi-Arc Co., Ltd., Bilston, Staffs., have arranged three-week courses for welding engineers, supervisors, inspectors and foremen. The next of these will begin on July 13th, and another on October 5th. Applications for enrolment should be made to Bilston, or to the company's London offices at Bridgewater House, Cleveland Row, St. James's, S.W.1.


Watchman . . .
what of the night?
All's well. For with more and more N.F.11 night fighters joining the defence squadrons of the R.A.E. and NATO countries, Europe can sleep more peacefully. Long range, fast climb, heavy fire power and fine search radar make the Armstrong Whitworth N.F.11 the most formidable and effective night fighter in service.
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The Westland Helicopter is the only one of its size with the rotor pylon so designed to give complete loading and unloading safety at any rotor speed. The undercarriage also is devised to give ample clearances when landing on rough ground. These are amongst the features appreciated by the many operators of Westlands S51's throughout the world.

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S·55 & S·51 *HELICOPTERS*

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CIVIL AVIATION

"Flight" photograph

OFF THE BEATEN TRACK: DC-3s and DC-4s of Bharat Airways normally operate on Indian domestic routes or the company's international services from Calcutta to Burma, Singapore, Thailand and Indonesia. This DC-4 was photographed at Nicosia, Cyprus, on a Government-chartered flight to Jerusalem with a large complement of Indian emigrants.

NEW SERVICES APPROVED

THE Minister of Civil Aviation has approved the operation of the following air services :—

(1) Internal services to Weston-super-Mare (subject to Weston-super-Mare aerodrome remaining in flying use) : (*a*) Birmingham-Cardiff-Weston-super-Mare : Don Everall (Aviation), Ltd., until December 31st, 1959 (no traffic rights between Cardiff and Weston-super-Mare); (*b*) Cardiff-Weston-super-Mare : Cambrian Air Services, Ltd., until March 31st, 1960.

(2) A normal scheduled service on the route London-Rome-Cairo-Khartoum-Entebbe-Nairobi-Lusaka, and later Salisbury : B.O.A.C. until December 1st, 1959.

(3) An ali-freight service on the route London-Nicosia-Tripoli (Lebanon) - Kukuk - Baghdad - Basra - Kuwait - Dhahran - Bahrein - Dukham and/or Jebal Ali *via* technical stops at Nice, Malta or Rome, and Mersah Matruh or Athens : Airwork, Ltd., until March 31st, 1960.

(4) Three services a week through Cyprus (Nicosia) on existing Corporation routes between the United Kingdom and the East : B.O.A.C. until March 31st, 1960.

(5) The extension to Las Palmas until December, 1955, of Aquila Airways' flying-boat service between Southampton and Madeira.

AUSTRALIAN MAIL PAYMENTS

THE Australian Civil Aviation Agreement Bill, which was passed last October, has resulted in an equalizing of the amounts paid to T.A.A. and A.N.A. for the carriage of air mail. During the three-month period ended January 31st, A.N.A. received £57,200 for carrying 524,000 lb of mail, and the payment to T.A.A., the state-owned airline, was £58,050 for carrying 528,100 lb. Previously, T.A.A. held a virtual monopoly in the carriage of air mail.

AIRPORT ENCLOSURES OPENED

PUBLIC enclosures at London and Northolt Airports re-opened just before Easter and will remain open daily from 11 a.m. until dusk each day. Recommended public-transport approaches are : L.A.P., by 81 and 81A buses from Hounslow West Station or by Green Line coaches 704 and 705 from Victoria; Northolt, by 97 bus from Ruislip Station or on foot from South Ruislip Station. Other M.C.A. airport enclosures open to the public are at Prestwick, Liverpool, Birmingham, Croydon, Blackpool and Cardiff. Short pleasure flights may be made from London, Northolt, Blackpool, Birmingham and Cardiff. There were over 650,000 visitors to State-owned airports last year, more than half of them at London and Northolt.

AERODROME OWNERS' A.G.M.

AT the recent 26th annual meeting of the Aerodrome Owners Association, Colonel R. Mould-Graham, O.B.E., M.C., T.D., of Newcastle-on-Tyne Corporation, was elected chairman for the ensuing twelve months. Mr. Charles Newton (Sywell Aerodrome, Ltd.) was elected vice-chairman.

The executive committee, consisting of eight municipal and eight commercial members, has undergone only one change : Airwork, Ltd., takes the place of Handley Page, Ltd.

FUTURE COMET SERVICES

SOME recent reports about B.O.A.C.'s forward plans for Comets have been most misleading. For example, the implication of one forecast, attributed to Sir Miles Thomas, was that the Corporation's jets would be flying the North Atlantic by 1954, and that the time for regular flights from London to New York would be less than seven hours. The position, as we understand it, is as follows.

Late this year B.O.A.C. will take over the true prototype Series 2 Comet with Avons (G-AMXA). This is not the so-called Series 2X, which has been flying for 14 months (and is, in fact, a modified Series 1 with Avon engines), but the first of the new batch of 11 Series 2 machines. Depending upon the delivery time of the first Series 2, it may be that the 2X will be loaned to B.O.A.C. for a short period to enable them to start their trials. Avon-Comet trials on the South Atlantic route will begin immediately after delivery, in preparation for revenue passenger services to South America with production Series 2s during the spring or early summer of 1954.

The possibility of Comet 2 services to Australia has also been mentioned. As soon as a Series 2 machine, possibly the prototype, can again be made available—and this is expected to be in mid-1954—a regular programme of flights over the North Atlantic will begin to investigate upper-air conditions on this route. These are the only Series 2 flights likely to be undertaken over the North Atlantic and there is no intention of putting Series 2s on North Atlantic revenue services.

The first North Atlantic regular services with Comets are planned for late 1956 or 1957 with Series 3 Comets. B.O.A.C. has an option for ten of these 58-78-seat aircraft. Direct Comet flights between London and New York are unlikely, although the time between the two capitals will probably be in the region of seven hours.

In connection with the B.O.A.C. programme for investigating upper-air conditions over the North Atlantic, it has been suggested in *Flight's* correspondence columns—and the idea seems worth considering—that some arrangement might be made with the

IBERIA, the Spanish airline, recently took delivery of the first of four Bristol 170 Mk 31Es, capable of operation in passenger or all-freight form. The handsome appearance of the Freighter, with its white top, red flash and yellow-and-red rudder exemplifies the effectiveness of "cheat" lines and suitable colours despite the homely appearance of the aircraft.

CIVIL AVIATION . . .

R.A.F. whereby Canberra crews undertake part of this work. In this way the Service could obtain valuable experience and at the same time carry out some of the research, economically subscribing to the pool of knowledge which is a necessary prerequsite to North Atlantic passenger service with jet aircraft.

HUNGARIAN AIR-TAXI SERVICE

USING Russian Po-2 biplanes capable of carrying two passengers, the Hungarian-Soviet Civil Air Service Company has introduced a private charter service at the standard rate of 2s per mile. Twin-engined Czech Aero 45s, carrying three passengers, will operate a similar service at exactly double this rate. Known as Mazoflet (Magyar-Szovjet Legiforgalmi Tarsasag), the company was formed in 1946, and is at present believed to be operating a fleet of ten Li-2s (Russian-built DC-3s).

QANTAS CHOOSE BRITANNIAS

AS forecast in *Flight* of April 3rd, Qantas Empire Airways have signed a letter of intent to purchase six Bristol Britannia Mk 300s for use on their long-range routes. The exact delivery date is not yet known and might depend on the degree to which production for Qantas could overlap construction of some of B.O.A.C.'s 30 Britannias, five of which will be all-freight versions. The Mk 300 is to be a "stretched" Britannia with 10ft 3in fuselage extension to permit carriage of a larger number of passengers—or, alternatively, a higher degree of comfort on long-range routes.

K.L.M. ORDER MORE CONVAIRS

SIX more Convair-Liner 340s have been ordered by K.L.M., bringing the Dutch airline's total order for this twin-engined, 44-seat type to twelve. Deliveries, beginning this year, will extend into 1954. Convair have already delivered 61 of their total back-log for 170 Model 340s, and production is now at the rate of eight aircraft per month. Despite the growing popularity of the Viscount, the American company is confident of receiving more orders and has in fact made provision for the construction of a further 59 CV-340s.

CARIBBEAN ACCIDENT

TEN of the eleven passengers and the crew of three were lost when a Lockheed Lodestar of Caribbean International Airways crashed into the sea shortly after taking-off from Palisadoes Airport, Kingston, on April 10th. W/C. Owen Roberts, who founded the airline 4½ years ago, was among those killed. The primary activity of the company has been the operation of frequent services between Kingston and the Cayman Islands, originally with Catalinas; construction of an airstrip on Grand Cayman recently made possible the use of the Lodestar. The question of licensing C.I.A. was discussed in Parliament on January 23rd, when Mr. Hopkinson, Minister of State for Colonial Affairs, refuted a suggestion that the interests of the company, which had pioneered the routes to Cayman and Tampa, were to be sacrificed to B.W.I.A.

B.O.A.C. TRAINS R.C.A.F.

ROUTE training of R.C.A.F. Comet crews is now being carried out by B.O.A.C. personnel on the normal Comet route between London and Johannesburg *via* Rome, Cairo, Khartoum, Entebbe and Livingstone. Capt. B. E. Rodley, officer in charge of training (Comet fleet), commanded the first overseas flight by the R.C.A.F. Comet 1A, which left for Johannesburg last Friday, and the Corporation also provided a supervisory navigator and engineer. A second flight is due to begin on Monday next. The occasion of last week's departure is illustrated on page 477.

Shortly after departure from London, Capt. Rodley became the first airline pilot to have flown 1,000 hours on jet airliners. Mr. John Cunningham, de Havilland's chief test pilot, is the only man to have spent more time at the controls of Comets.

AQUILA FARES CUT

REDUCTIONS of one-third in their summer fares from Southampton to Madeira and to Las Palmas are announced by Aquila Airways, Ltd. The 21-day return fare to Madeira is now £59 10s compared with £89 2s, and that to Las Palmas becomes £69 10s compared with £98 8s 3d. The company reports that bookings to Madeira are particularly heavy.

COMET CEYLON SERVICE RE-SCHEDULED

ALTHOUGH B.O.A.C.'s weekly Comet service to Colombo, Ceylon, has been operating since August 11th last year, passengers have not been permitted to board a return aircraft at Colombo until April 10th. Under the terms of the Anglo-Ceylonese bilateral agreement, B.O.A.C. has the right to pick up traffic at Colombo on two weekly services only—and two Argonaut services were already in operation when Comets first began to fly the route. But for the fact that Air Ceylon's London service left Colombo on Wednesday, the same day as the Comet, it might have been possible to forfeit traffic rights for one of the Argonaut services. However, the problem has now been partly solved by a change in Comet schedules, effective from April 8th. A Comet now leaves London on Wednesday of each week and arrives in Colombo the following day, enabling it to take-off from Colombo on Friday.

IMPROVED A.B.C. GUIDE

INDICATIVE of the growing importance of air freight is the decision of the publishers of the *A.B.C. World Airways Guide* to incorporate a special air cargo section in further issues. This supplement, printed on a distinctive coloured paper and fully cross-referenced with the gazetteer section, will provide full information on all scheduled cargo services together with the various regulations covering the carriage of freight. Details of any changes in routes or rates will be given by the existing amendments service.

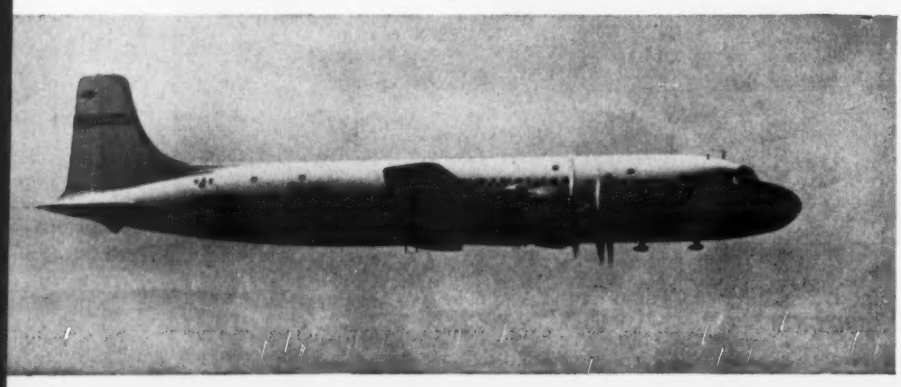
WORKS OUTING—BY AIR

AN unusual charter was undertaken by Silver City Airways over the Easter week-end, when six of the company's Freighters carried 252 employees of Frigidaire, Ltd., from Lympne to Le Touquet and back. Passengers made the 47-mile air crossing at dawn on Good Friday, April 3rd, and returned on the evening of Easter Monday. Normally, of course, the Freighters are used to carry vehicles as well as passengers, and for the purpose of this charter the large vehicle-holds had to be fitted with additional passenger seats—42 all told, compared with the normal complement of 12 passengers.

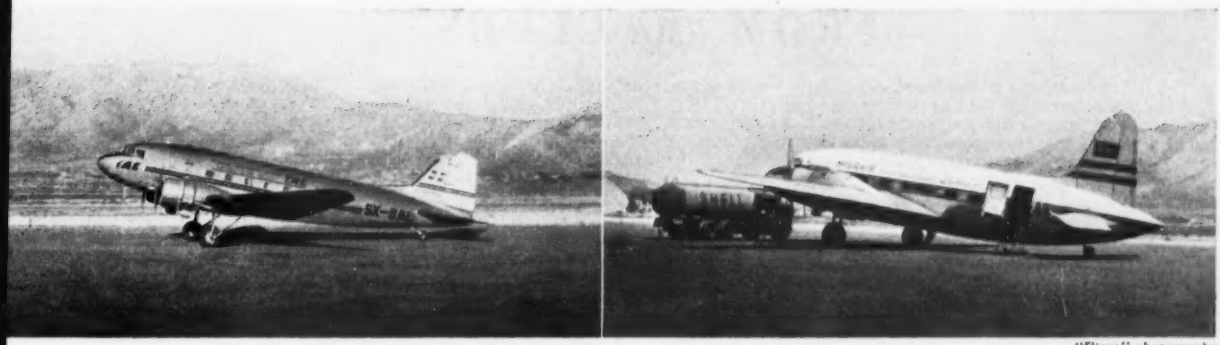
The surplus seats were removed during the peak Easter traffic period, when 250 cars, 100 motor cycles and 150 pedal cycles were carried. The fact that only 23 cars, six motor cycles and 21 pedal cycles were carried during the same period last year is a measure of the manifold increase in traffic which Silver City have experienced since fares were drastically reduced early this year.

C.P.A.'s COMET ROUTE

ACCORDING to a Melbourne report, a weekly DC-6B service between Sydney and Vancouver will be introduced on April 29th by Canadian Pacific Airlines. Pending the introduction of Comets, the DC-6B, equipped to carry 52 passengers, will offer a faster and more comfortable service than the DC-4s now used. C.P.A.'s intention to introduce a Comet 1A service between Sydney and Honolulu, with DC-6Bs completing the trans-Pacific flight to Vancouver, was naturally affected by the loss of the first machine at Karachi while *en route* to Sydney. But despite the difficulty of operating a scheduled service with only one aircraft of the type concerned, C.P.A. has announced its decision to place its single Comet 1A in service on the Sydney-Honolulu route, as originally planned. Training of crew-members is at present under way at Hatfield. Suggestions that the R.C.A.F. might forego delivery of one of its two Series 1A Comets in favour of C.P.A. have not been confirmed. The type is now out of production, and construction of a replacement is therefore impossible.



BIGGER AND BETTER: The use of larger—and, in many cases, more luxurious—aircraft on European routes is likely to be a feature of the new summer airline schedules which take effect on April 19th. Douglas DC-6Bs carrying 75 passengers will be used by Scandinavian Airlines System on the London-Copenhagen-Stockholm route.



"Flight" photographs

HOME AND AWAY: Hellenikon Airport, Athens, is the focal point for the network of domestic and international services operated by TAE (Greek Airlines), one of whose 18 DC-3s is seen (left) returning to the Greek terminal. The Misrair Viking, one of seven operated by the Egyptian airline, is calling at Athens on the weekly service from Cairo to Istanbul via Nicosia and Hellenikon.

W. D. VAN OS, O.B.E.

FRIENDS in the British aircraft industry learned with regret of the sudden death, in Holland on March 19th, of Mr. W. D. van Os, adviser to the production directorate of K.L.M. Mr. van Os who was 56, joined K.L.M. in 1926; during the war, at Whitchurch Airport, Bristol, he was responsible for the technical organization of the airline's service between England and Lisbon. He frequently visited the United Kingdom in the post-war years and was well known in aircraft manufacturing circles. A colleague in Holland writes that he "was always full of enthusiasm to defend English products against other markets."

HIGH-DENSITY ARGONAUTS

ARGONAUTS furnished to carry 56 passengers are being used on B.O.A.C.'s cut-fare services from London to Lod (Israel), Singapore and Hong Kong. Early in May they will replace Hermes 56-seaters on the weekly London-Rome-Cairo services, making an additional stop at Frankfurt subject to government agreement. An Argonaut service to Beirut *via* Rome will be introduced at the same time. The Hermes will continue to maintain low-fare services to East Africa and Northern Rhodesia. It is estimated by the Corporation that approximately one-third of the total seating capacity during the coming summer will be offered at tourist fares. On the North Atlantic route 65-seat Constellations will continue to operate all B.O.A.C.'s cut-fare services.

LOCKHEED'S BIG BACKLOG

THE annual report of the Lockheed Aircraft Corporation shows that at December 31st, 1952, the company held outstanding orders for 70 Super Constellations and the associated spares and services, representing a total value of nearly £44 m. These commercial orders, placed by 11 different airlines, form only 8 per cent of Lockheed's 1952 backlog (which, incidentally, was 66 per cent higher in terms of dollars than that for 1951). Lockheed's sales last year were valued at more than £155 m, of which 10 per cent was paid by airlines. By the end of the year the company had spent over £350,000 on jet transport studies intended to place Lockheed "in a good technical position for the time when military or commercial market conditions justify further effort." The report expresses the belief "that 1953 will certainly see important decisions in the American commercial jet transport field."

BREVITIES

ELIZABETHANS in service with B.E.A. flew about 10,000 revenue hours during the year ended February, 1953, earning some £1.5 m, and are expected to log 28,000 hours and earn £4 m over the following 12-month period. Viscounts are scheduled to fly 14,000 hours by February, 1954, earning at the rate of £185 per hour.

* * *

Aviation Meteorology on the Route Marseilles-Rome-Athens-Cairo is the title of a 68-page report issued by the Meteorological Office and published by Her Majesty's Stationery Office at 2s. 6d.

* * *

Formerly leased to Airwork, Ltd., by Eagle Aviation, Ltd., three Viking 1As have now been sold to the former company.

* * *

The London School of Air Navigation reports that it now undertakes to coach students for type ratings (general and specific).

* * *

Four-seat Bristol 171 Mk 3As are expected to re-open B.E.A.'s London-Birmingham passenger service on July 27th. The service will be preceded by freight flights to Elmdon and a number of proving flights to Haymills, terminal for the passenger service.

* * *

To mark "Flower Fleet Day" at Schiphol, Amsterdam, K.L.M. stewardesses presented bouquets of spring flowers to every passenger arriving at or departing from the airport on April 9th.

* * *

Overhaul time of Wright C18BD engines powering the six L649A Constellations of Chicago and Southern Airlines was recently increased from 1,600 to 1,700 hours. Average utilization of these aircraft on comparatively short stages is 8¼ hours. Normal cruising speed is 254 m.p.h. and the average stage is 380 miles.

* * *

Mr. W. de Mier, who has been appointed general manager for K.L.M. in Mexico and Central America, is to be succeeded as general manager for the U.K. and Ireland region by Mr. R. L. G. Borgerhoff Mulder. Trained as a pilot at Cranwell in 1940, Mr. Borgerhoff Mulder made 70 bombing sorties with the R.A.F. during the war. Since 1949 he has been a member of K.L.M.'s foreign-policy bureau in The Hague.

* * *

Special procedures for flights to the Channel Islands during the busy summer period are set out in *Notams* No. 170 and 178. A new system of parking aircraft on the apron at Ringway Airport, to avoid congestion during the summer, is the subject of *Notam* No. 171.

* * *

Fares on certain routes of British West Indian Airways were increased on April 1st to offset "steadily rising costs." A B.W.I.A. announcement noted that the company's fares had previously been maintained at a level below that recommended by I.A.T.A. The airline will open a new route between Kingston and Maracaibo, Venezuela, on May 1st.

* * *

Aer Lingus summer schedules feature nearly 200 flights weekly and accommodation for 6,000 passengers on the company's busiest route—that between Dublin and London. Of this accommodation 1,350 will be offered on 48 "Starflights" at the reduced fare of £10 return. The weekly total of seats offered by Aer Lingus on all routes will be about 17,000.

* * *

B.E.A.'s new Waterloo Air Terminal, due to be opened on May 19th, will also be used by passengers of Air Lingus, Air France, Iberia, Sabena, S.A.S. and Swissair. To avoid traffic delays during the Coronation period, the Waterloo building will be closed between 11 p.m. on June 1st and 7 a.m. on June 3rd; the White City Stadium will be used as a temporary terminal.

* * *

M.C.A. investigations into the forced landing of an Aer Lingus Dakota in Warwickshire on January 1st have been suspended, following the decision of the Irish Department of Industry and Commerce to hold a public inquiry into the incident. The aircraft, EI-ACF *St. Kieran*, was extensively damaged, but the 22 passengers and crew of three escaped injury.

FROM THE CLUBS

UNDER the auspices of the Royal Aero Club, a national air touring competition is to be held on July 25th, 1953. The handicap formula will give credit for low fuel consumption and high cruising speed (compared with the aircraft type's standard performance), navigational skill and accurate forecasting of E.T.A.s. The course will be approximately 200 miles, around a closed circuit, and prizes of £100, £50, £25 and £15 will be awarded. Enquiries should be addressed to the Secretary-General of the Royal Aero Club.

THE Rhodes centenary, this year, is being celebrated in Rhodesia by an air rally and flying display at the new Salisbury airport on June 13th-14th, in addition to other events. A comprehensive programme is planned for the rally, in which the Services, airlines, flying clubs and private owners will participate. British clubs or private owners who are interested should contact the Air Touring Department of the Royal Aero Club.

IN the March Bulletin of the Popular Flying Association, the Cambridge Private Flying Group mention the possibility of their obtaining an Autogiro for group use. The Experimental Group at Redhill now have a second Hawk III trainer, G-ALIO, and test flying with the Heath Parasol is continuing. The Flintshire Aviation Group has been reorganized, and foresees gliding as a main activity, while the Ipswich Group, in spite of hangarage difficulties, have their two Austers flying and are working on the Zaunkoenig. Considerable difficulty in obtaining a local landing field is reported by the Montgomeryshire U.L.F.C., whose Tipsy is at present at Wolverhampton. Among the personal notes in the Bulletin appears the news that David Ogilvy hopes to take over Martlet G-AAYX in the near future and to have it flying before the end of the season.

AN additional full-time flying instructor, Mr. A. Noyes, has taken up his duties with the Elstree Flying Club. The Club reports a total of 132 hr 10 min flying time during March.

THE number of hours flown by the Strathtay Aero Club during March amounted to 91. One of the club's members, Dr. Lillie, has recently returned after an eighteen-month visit to Canada.

TWO P.P.L.s were gained by members of the Denham Flying Club during March, and a total of 80 hours were flown. The Airways Aero Club has now moved from Denham to Croydon.

TICKETS for the ball to be held in aid of the Fifth International Rally Fund, by the Yorkshire Aeroplane Club in Leeds on April 23rd, are available from the Club. Total flying time for March was 100 hr 15 min, compared with 25 hr 25 min for the corresponding period last year.

GLIDING AT EASTER

AT the invitation of the Midland Gliding Club, a task-flying match took place at Long Mynd, Shropshire, over the Easter week-end. After a practice day on Good Friday, the task set for Saturday was a flight to Great Hucklow, Derbyshire, the home of the Derbyshire and Lancashire Gliding Club, 73 miles away. The only competitor to reach the goal was Mr. Philip Wills, the world champion, whose speed of nearly 45 m.p.h. gives him the U.K. glider speed record for 100 kilometres.

On Easter Sunday snow covered Long Mynd, which is 1,400 feet above sea level, and no flying was possible. On Monday the wind obligingly blew up hill again but, although much slope soaring was done, thermals were few and the only two competitors who attempted cross-country flights landed near Bridgnorth, about 25 miles to the east.

On Tuesday, April 7th, the last day of the meeting, conditions were more congenial and some excellent flights were made. Outstanding was that of Lt. Cdr. G. A. J. (Tony) Goodhart in the little Mu 13, who completed his Gold C qualification and obtained a diamond for it with a goal flight of just over 300 km (186 miles) to Leiston on the Suffolk coast. A flight of 100 miles was made by Lionel Alexander of the Cambridge University Gliding Club whose wife Barbara, also a competitor, reached Desford, Leicester, nearly 70 miles from Long Mynd. Noel Anson of the London Gliding Club had declared Dunstable as his goal and was within sight of it when he was forced to land at Cranfield.

The International Gold award won by Lt. Cdr. G. A. J. Goodhart is only the twelfth to be won by a British pilot, and one of the other holders is his brother, Lieut. Cdr. H. C. N. (Nick) Goodhart. Only three of the other holders have made the 300 km. goal flight in the United Kingdom, and it is understandable that the 300 km flight (which with the climb of 3,000 metres constitutes the test) is regarded in this country as a difficult task.

AT Lasham the soaring season opened on Easter Saturday, when the Surrey and Imperial College T.21b two-seater flew 88 miles to the Cambridge Gliding Club, and John Neilan in an Olympia visited the London Gliding Club at Dunstable.

The cost of long-distance retrieves is becoming more than most pilots can manage, so the Club has set three triangular courses for cross-country flying from Lasham.

The Red triangle (40 km) is for local racing, early soaring, and for general practice; the Yellow triangle (64 km) is for Silver C distance flights; and the Blue triangle (100 km) is for advanced soaring and attempts on the world closed circuit speed record. All three triangles are clear of airways and busy airfields.

The two clubs at Lasham (The Army, and the Surrey and I.C.) are hoping this year to achieve 15,000 launches and 1,200 hours. Last year's total was 11,000 launches and 1,000 hours.

LIGHT AVIATION IN FRANCE

THE active and healthy state of popular flying in France is evident from the report for 1952 published by the Light and Sporting Aviation Section of the Department of Civil Aviation—a unit of the French Ministry of Public Works and Communications. The number of flying hours performed during 1952 by powered aircraft was 135,104, compared with 42,000 in 1947 and 107,071 in 1951; and by sailplanes and gliders during the year 80,312, the figures for 1947 and 1951 being 39,900 and 54,299.

The three main categories described in the report are those of aëromodelling, powered and gliding flight, and parachuting—this last possibly seeming an unusual sport to British readers, but one firmly established across the Channel. The most significant part of the aeromodelling section concerns the teaching in this subject given on a national scale in French schools—an obvious and useful method of instilling the air-faring outlook at an early age.

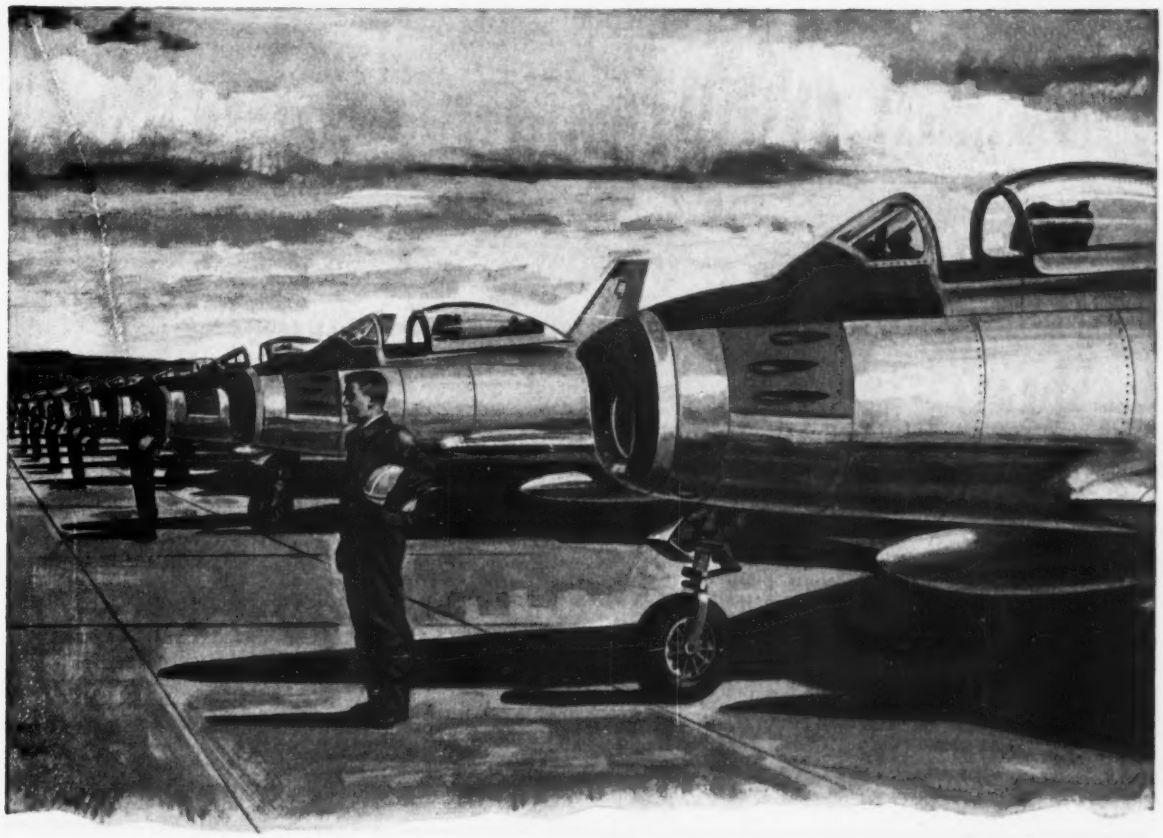
In the realm of full-scale aircraft, results obtained by the subsidized French flying movement were even more impressive. Five national civil-aviation centres were in use during the year, three for gliding and two for powered flight, in addition to civilian-operated centres for the initial training of Service pilots on powered aircraft. The country possessed 308 separate clubs, 214 of which combined powered flying and gliding facilities, and 15 regional "inter-club centres" or groups. Of the flying totals performed, 35,716 gliding hours and 42,353 powered flying hours took place at the national centres, and 44,596 and 92,751 hours respectively at the clubs.

The most optimistic hopes for "le parachutisme" were exceeded during 1952, when over 300 preliminary parachutists' certificates were obtained. Using the facilities of the national parachuting centre at Saint-Yan, two regional centres and 38 clubs, the country's parachuting enthusiasts made a total of 4,912 jumps, of which 2,482 were static-line releases and 1,928 were delayed drops. The total for the previous year had been 2,854.

Much progress was made towards obtaining new aircraft during the year. Prototype studies for an all-metal, two-seat, low-wing training aircraft for national-centre use had been commenced, while for the clubs the SIPA 902, Brochet MB 120, and Minicab GY 30 machines were recommended. Orders for second prototypes of the SIPA 200 turbojet and the Boisavia B 603 towing aircraft had been placed. Designs for high-performance, stratospheric and training sailplanes had been studied, and the flying wing Fauvel A.V. 36 sailplane was undergoing official trials. Deliveries of new aircraft had included 10 Minicabs, 10 Jodel IIIs, and 10 Brochet MB 80s

Projects for 1953 included further design work on the stratospheric sailplane, on an all-weather high-performance sailplane (such a machine was needed for the 1954 international contests in the Argentine), and on the two-seat trainer. Powered aircraft development would continue, and among engines being developed were the Beaussier (45 h.p.), Lutetia (45 h.p.), Panhard Wassmer (25 h.p.), Westinghouse (65 h.p.) Mignet (65 and 90 h.p.).

Several international records had been obtained by French sailplane and powered-aircraft pilots during the year, and of the 28 international gliding records, eight were held by France; the nearest rivals being the U.S.S.R., also with eight, and the U.S.A. with seven.



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For further information: European Representative, J. H. Davis, Princes House, 190 Piccadilly, London, W.1., England.

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Fish Planting: The Air Division of Canada's Department of Lands and Forests has recently developed efficient new equipment for this purpose. Consisting of two large aluminum water tanks aerated periodically by a connecting oxygen tank, the fingerlings are released through a funnel fitted into the aircraft's former camera hatch, through which they are dropped from heights of 300 to 500 feet. The Department of Lands and Forests report that 100% of the yearlings survive. Since flying began . . . Canada has been an air-minded nation, and from executive work to prospecting for oil, Canadians continue to make the airways an essential part of their great development.

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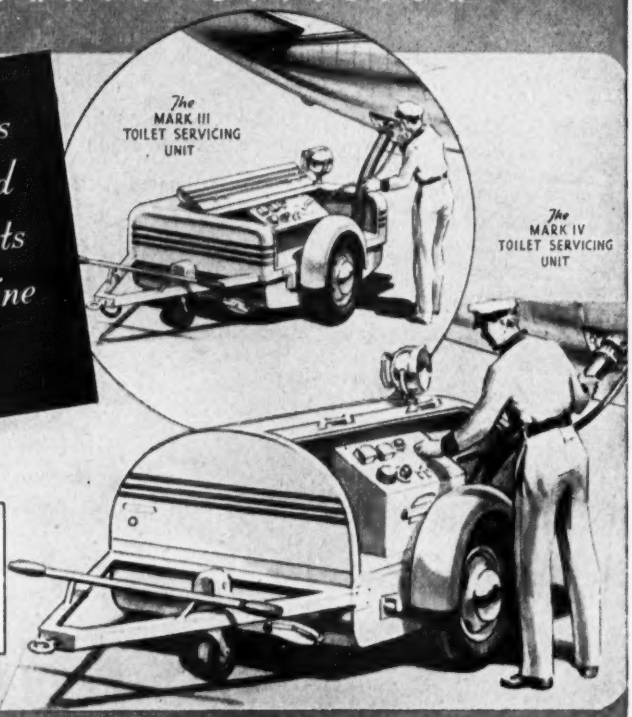

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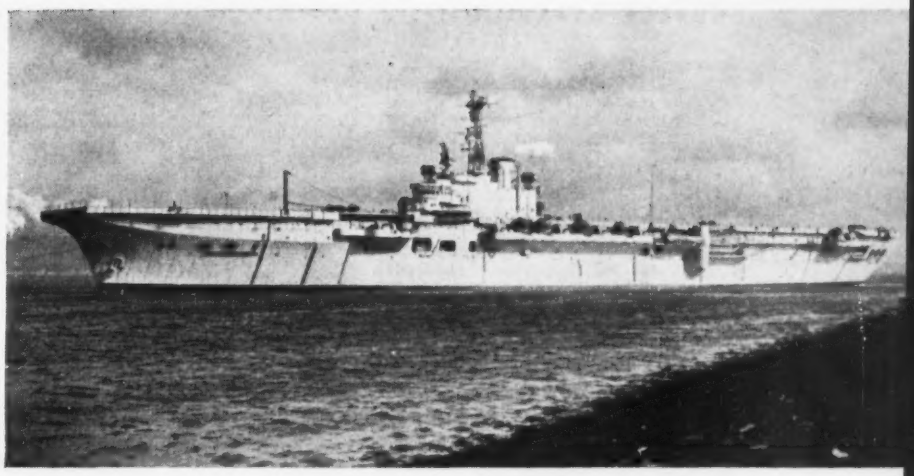

SOON FOR SERVICE: The new Hermes-class carrier, H.M.S. "Centaur," leaves the Belfast shipyards to begin her steaming trials. "Centaur" has a displacement of 18,300 tons.

Iraq Command Badge

AT a recent ceremony at R.A.F. Station Habbaniya, the home of Air Headquarters Iraq, A.V-M. J. G. Hawtrey, C.B.E., was presented with the new Iraq Command badge by the A.O.C-in-C. M.E.A.F., Air Chief Marshal Sir Arthur Sanders, K.C.B., K.B.E. The badge carries the traditional five-winged Assyrian bull, and the motto *Pennae Extente* ("Spread your wings").

Addressing the parade, the C-in-C. recalled how Air Headquarters Iraq had developed following the British Government's decision in 1922, on the advice of Mr. Churchill, then Colonial Secretary, to withdraw all army units and entrust the protection of the newly-created kingdom of Iraq to the R.A.F.

R.A.F. Appointments

AT present A.O.A. 2nd T.A.F., A.V-M. J. R. Whitley, C.B., C.B.E., D.S.O., A.F.C., is to become A.O.C. No. 1 Group Bomber Command, with effect from April 27th. His place at 2nd T.A.F. will be filled by A. Cdre. W. G. Cheshire, who will assume the acting rank of air vice-marshal.

During the war A.V-M. Whitley served in Bomber Command as a squadron commander, in the operations room at headquarters and as a station commander; he also commanded a group. He took the 1950 course at the Imperial Defence College.

A. Cdre. Cheshire has been commandant of the R.A.F. Staff College, Andover, since last April, and was formerly A.O.C. Gibraltar. In 1942-43 he was air attaché in Russia.

Aircraft Recognition Trophy

ON Saturday last the first contest for the R.A.F. Aircraft Recognition Trophy was held in the assembly hall of the University of London. Winners were : 1st, No. 29 Q Cluster, Lancaster Group R.O.C., with 126 points out of a possible 150; 2nd, R.A.F. Tangmere, 119 points; 3rd, R.A.F. St. Eval, 117 points. The highest individual scores were : Chief Observers Wilkinson (29 Q Cluster) and Hay (35 C Cluster, Oban), both with 47 points out of a possible 50.

The trophy, a silver cup, was presented to the winners by A.V-M. T. N. McEvoy, Assistant Chief of the Air Staff (Training).

In these contests, 50 photographs of aircraft are projected by means of a flash trainer, the first 30 exposures being of one-second duration and the last 20 exposures of half-second duration. In the event of a tie, the winning team is decided by a further test of ten photographs at an exposure of one-fifth of a second. It is open to all R.A.F. stations in Britain and 2nd T.A.F. in Germany, and to the Royal Observer Corps. Teams comprise three persons irrespective of rank, trade or sex.

North Polar Flights

EARLY next month, Hastings aircraft from the R.A.F. Flying College, Manby, Lincolnshire, are to make four flights over the North Pole.

Two machines will be employed, captained respectively by S/L. H. D. Archer, D.F.C., and F/L. R. W. Firmin, D.F.C. Each Hastings will carry a complement of 15, made up of the captain, two staff navigators, five students and other air and ground crew. They are due to leave Manby on April 30th for Keflavik, Iceland, whence they will proceed on May 1st to the R.C.A.F. Arctic base at Resolute Bay.

From Resolute Bay the two aircraft will make two 11-hour flights, during which they will pass over the North Pole, giving the students—who are, of course, already skilled navigators undergoing post-graduate training—experience of long-range navigation over featureless areas where magnetic compasses are unreliable. Various specialized techniques are being employed.

If all goes to schedule the Hastings are due to leave Resolute Bay early on May 6th for a 2,860-mile non-stop flight to Manby, which should be reached at about 1800 hr.

Burma Book of Remembrance

THE two volumes of the Burma Book of Remembrance, containing the names of the British men and women who gave their lives in the Burma campaign, have now been placed in the Forces Memorial Chapel in Rangoon Cathedral.

At a recent service, one volume, which contains the names of 2,285 members of the R.A.F. in addition to Royal Naval personnel, was handed to the Bishop of Rangoon by A. Cdre. E. L. S. Ward, D.S.O.; the other, containing the Army names, was given to the Bishop by Col. H. C. Baker-Baker, D.S.O.

More R.C.A.F. Transports

HEADQUARTERS of the Royal Canadian Air Force has announced the formation of a fourth transport squadron, which will be stationed at Dorval. It will be known as No. 436 Transport Squadron and commanded by S/L. K. C. M. Dobbin who, until recently, was a flight commander in No. 438 Transport Squadron.

The new unit will be the second squadron of the R.C.A.F. to be equipped with Fairchild C-119s.

Mason Memorial Trophy

THE "Imshi" Mason Memorial Trophy, competed for annually by squadrons of Middle East Air Force Command, and awarded for efficiency in weapons training, has been won for the second successive year by No. 6 Squadron, now stationed in Iraq.

Since the trophy was first put up for competition in 1949, No. 6 Squadron has never been lower than second place and for 1952 gained a percentage of 79.6.

The trophy, given by Mrs. T. Mason in

FOR FIGHTER COMMAND: An air-to-air photograph of the first of a number of Bristol Sycamores to be used by Fighter Command for air/sea rescue and communications.

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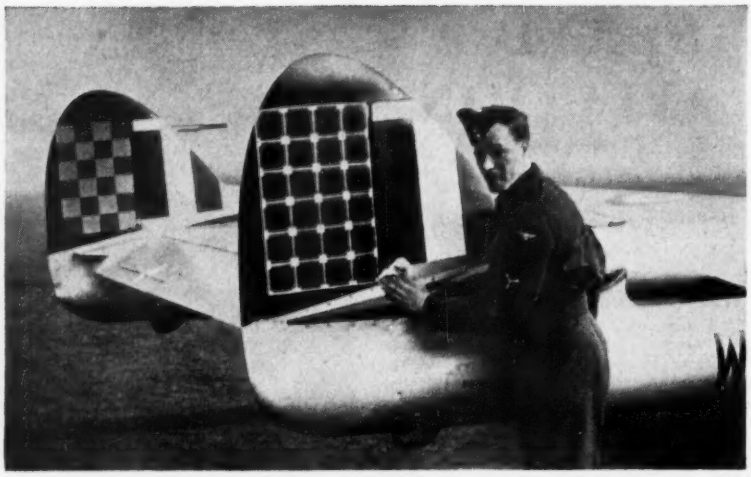
memory of her son, S/L. E. M. ("Imshi") Mason, D.F.C.—killed in the Western Desert in 1942 while leading Nos. 92 and 112 Squadrons—was presented to No. 6 Squadron's commander, S/L. E. J. Roberts, by the A.O.C-in-C. Middle East Air Force, Air Chief Marshal Sir Arthur Sanders, K.C.B., K.B.E., at a recent parade, at which he took the salute at a march-past.

In 1949, Nos. 6 and 249 Squadrons jointly won the trophy, No. 249 winning it in 1950 and No. 6 in 1951. The 1952 competition revealed an improvement in weapons efficiency in all squadrons competing.

No. 6 Squadron, formed at Farnborough in January, 1914, saw much action during World War I, and in 1915, Lt. Walker, a squadron pilot, was awarded the first Victoria Cross for air combat. During World War II the squadron operated in a ground-attack rôle, achieving considerable success with its Hurricanes.



TWO-BADGE MAN: The markings of Nos. 612 (County of Aberdeen) and 603 (City of Edinburgh) Squadrons, R.Aux.A.F., on the tail of the Vampire flown by W/C. Duncan Smith, who is station commander and wing leader at Turnhouse, Edinburgh.

Canal Zone Air Defence

THE entire air defence mechanism of the Suez Canal zone was brought into play during the recent exercise "Session," which entailed a three-day work-out of the area's fighter interception control and reporting organization and anti-aircraft and air raid precautions. The exercise was under the direction of Air Chief Marshal Sir Arthur Sanders, A.O.C-in-C., M.E.A.F.

Varsities of Flying Training Command, and Meteors and Venoms from the Central Fighter Establishment, joined Vampire and Meteor squadrons drawn from all parts of the Middle East Air Force for the exercise. Royal Australian and Royal New Zealand Air Force squadrons based in the Mediterranean and No. 97 (Straits Settlements) Squadron of Bomber Command in Egypt on exercise "Sunray" also took part. R.A.F. Regiment light anti-aircraft batteries guarding airfields were augmented by British Army heavy anti-aircraft guns and an anti-aircraft unit of the Egyptian Army. Egyptian Air Force observers were invited, but did not attend.

The exercise developed in three phases, the first of which involved daylight operations only. Phase two started shortly after dawn on the second day, merging without a break into the last phase, which ended at midday on the third day.

The curtain went up with a sneak raid on Suez by Vampires simulating jet bombers, and this was followed by widely scattered raids at all heights throughout the day, on a variety of targets including airfields and military installations. Fighters were scrambled by the Zone's early-warning system.

The second phase began with a mass raid by Cyprus-based aircraft, aimed at knocking out the airfields at Abu Sueir and Deversoir. Later in the day umpires adjudged that one of the Deversoir dispersals had been put out of action; the squadron using it was switched to a reserve airfield, where the aircraft re-armed, refuelled and joined battle. Defending fighters in attacks on high- and medium-altitude raiders were hampered at noon by cloud at 20,000 to 30,000ft, which made visual contact difficult.

At dusk, bombing raids were launched over a wide area, and from then until dawn Lincolns, Varsities and Vampires were continuously active. Blackout was imposed in parts of the Zone. Interceptions of raiders attacking singly and in force mounted as the night wore on. After a short lull the weight of the offensive grew heavier towards dawn and at daybreak airfields were subjected to persistent sneak raids.

The final stage of the exercise was marked by the biggest mass raid of the exercise, all the strength the attacking forces could muster being thrown against the Zone defences in an attempt to saturate them. A.V-M. Satterly mobilized his entire defence chain. This was the climax of the exercise, which included virtually all squadrons in M.E.A.F., the Canal Zones' control and reporting system, its ground defences with technical and administrative backing, and the Sea/Desert Rescue Organization.

The Royal Yacht

THE 4,000-ton Royal Yacht, which was due to be named and launched by her Majesty yesterday, has the after end of the shelter deck specially strengthened for helicopter landings.

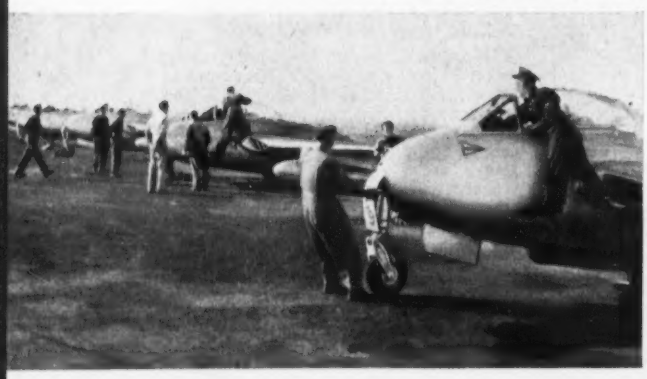
The vessel is designed in such a manner that it can be easily converted into a hospital ship in time of war, the royal apartments becoming operating theatres and wards. In such circumstances the ability to fly casualties aboard by helicopter would be a distinct advantage.

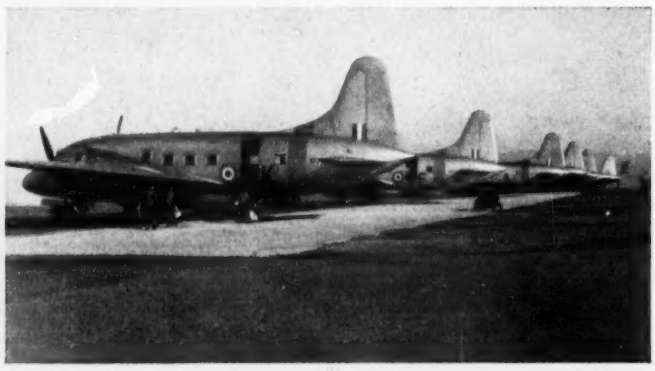
R.A.F. Club, Cape Town

THE secretary of the R.A.F. Officers' Club, Cape Town, Mr. E. A. R. Fowles, wishes us to remind anyone from Britain connected with aviation—Service or civil—that they will be very welcome at the Club if they are passing through Cape Town.

If intending visitors will contact him at Groote Schuur Residential Hotel, Rondebosch, Cape Town (telephone 6-2078), he will arrange to have them met.

ATTACKERS: Vampires of No. 78 Fighter Wing, Royal Australian Air Force, and Varsities of Flying Training Command, R.A.F., operating from Cyprus during the recent Middle East exercise "Session." (See "Canal Zone Air Defence," above.)





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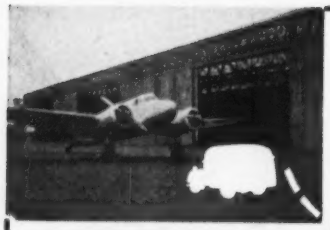

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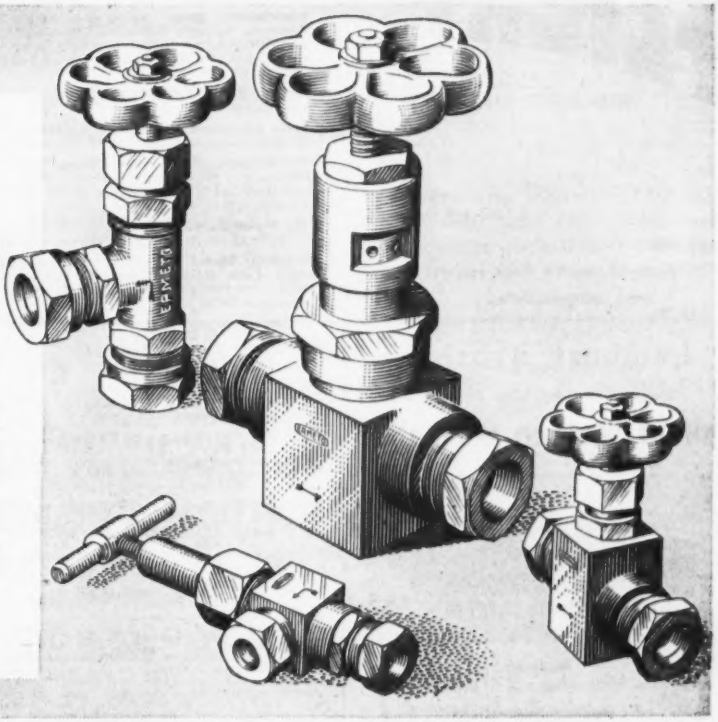

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

APPLICATION No. 184 from Eagle Aviation, Ltd., of 29, Clarges Street, London, W.1, for a traffic stop initially at Zagreb but later at Ljubljana on their normal scheduled service between London (Blackbushe) and Belgrade (Application No. 77) recently approved by the Minister of Civil Aviation.

APPLICATION No. 185 from Airwork, Ltd., of 15, Chesterfield Street, London, W.1, for a traffic stop at the Azores on their all-freight services between London and Montreal and London and New York (Applications Nos. 31 and 32) recently approved by the Minister of Civil Aviation.

APPLICATION No. 186 from Airlines (Jersey), Ltd., of 4, The Parade, St. Helier, Jersey, C.I., for an internal service for the carriage of passengers, supplementary freight and mail, to be operated with DH.89 and DH. Heron aircraft, on the route from Manchester and/or Coventry to Exeter, via an optional traffic stop at Weston-super-Mare, for the period up to March 31st, 1953, at a frequency of from four return flights weekly up to 12 return flights daily, the service to be integrated as the company may desire, with their normal scheduled services on the routes Manchester—Channel Islands—La Baule and Exeter—Channel Islands—Paris, recently approved by the Minister of Civil Aviation.

FROM Cambrian Air Services, Ltd., of Cardiff Airport, Cardiff:—

Application No. 187 for a U.K. internal service initially with DH.89 aircraft and later possibly with D.H Dove aircraft for the carriage of passengers and supplementary freight between Gloucester and Cheltenham (Staverton) and Bristol (Whitchurch) at a frequency of five services weekly increasing with traffic demand, during the period from May 2nd, 1953, to May 1st, 1963.

Application No. 188 for a U.K. internal service initially with D.H.89 aircraft and later possibly with D.H. Dove aircraft for the carriage of passengers and supplementary freight between Gloucester and Cheltenham (Staverton) and Guernsey/Jersey with an intermediate traffic stop at Bournemouth (Hurn), at a frequency of one service weekly increasing with traffic demand during the period from May 2nd, 1953, to May 1st, 1963.

THESE applications will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9, Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections. [9509

THE College of Aeronautics, English Electric Research Fellowship in Aeronautics. Applications are invited for a research fellowship which has been established at the college by the English Electric Co., Ltd. The fellowship is intended to provide opportunity for post-graduate research into problems of vibration or stability and control of aircraft, and is tenable for one year beginning on or about October 1st, 1953. The value of the fellowship is £500.—Applications, giving full particulars of education and experience, and quoting the names of three referees, are required by May 1st, 1953, and should be addressed to the Warden, The College of Aeronautics, Cranfield, Bletchley, Bucks. [9508

THE College of Aeronautics. Applications are invited for the Perring Scholarship in aeronautics, valued £400 per annum, tenable at The College of Aeronautics. The successful candidate will be admitted to the two-year course at the College. Applicants should preferably be honours graduates or final year undergraduates in engineering, mathematics or physics; applications from non-graduates with comparable qualifications will also be considered. Candidates must be British subjects domiciled in the United Kingdom. Forms of application and statement of conditions will be forwarded on written application to: The Warden, The College of Aeronautics, Cranfield, Bletchley, Bucks. The closing date for the receipt of applications is June 1st, 1953. [9491

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The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

RADIO engineer "A" licensed, required for Rapide and Dove fleet. Apply: Chief Engineer, Cambrian Air Services, Ltd., Cardiff Airport. [9481

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APPLICATIONS with full details as to age, experience etc., to the Personnel Manager, Marshall Flying School Ltd., Airport Works, Cambridge. [9487

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WRITE for interview, all expenses will be paid, to: Engineering Superintendent, Blackbushe Airport, Camberley, Surrey. [9390

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GRAVINER Colnbrook, Poyle Mill Works, Colnbrook, Bucks, invite applications for position of assistant to the chief inspector.—Applications, stating age, experience and salary required, should be addressed to the Chief Engineer. [9478

TECHNICAL illustrator required, aged 23 or over, with considerable practical experience.—Applications in writing to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds, stating age, experience and salary required. [9593

ROLLS-ROYCE, Ltd., Hucknall Aerodrome, Notts, have vacancies for senior designer draughtsmen, for aero engine installation work and technical illustrators capable of making perspective illustration from draughtsmens' drawings.
WRITTEN applications only to Personnel Manager, stating age and experience. [9493

URGENTLY required by engineering firm of repute in north-west district, plant and equipment, draughtsman, used to general maintenance work, plant layout and services. Must be capable of working on own initiative. —Apply, Box 5190. [9248

ENGINEERS required for inspection duties at Southend and Newcastle. Licences covering Dakota and Pratt and Whitney 1830. Only experienced engineers need apply to Chief Inspector, B.K.S. Engineering, Ltd., Southend Airport, Southend-on-Sea, Essex. [9511

GROUND engineer, A and C Licences covering Magister, Auster, Messenger and Aerovan, required immediately for flying club on South Coast.—Apply in own handwriting, giving full details licences held, availability, etc., to Box 6534. [9513

SENIOR and intermediate design draughtsmen, with good experience of aircraft or light structural or mechanical engineering required for aircraft and armament project work.—Apply by letter to Portsmouth Aviation, Ltd., The Airport, Portsmouth. [9260

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APPLICATIONS are invited from senior and intermediate design draughtsmen. Experience of aero-engine design desirable, but not essential. Also checkers. —Please write, stating age, and giving details of previous experience in chronological order, to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [9690

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SITUATIONS VACANT

BRITISH EUROPEAN AIRWAYS require licensed aircraft engineers at U.K. stations. Applicants should possess "A" and "C" licences for Dakota and, in some cases, for DH.89 aircraft. Other licences advantageous. Salary scale £11 5s. 6d. to £13 10s. 0d. p. w. After qualifying periods, pension, insurance and sick pay schemes, three weeks' annual holiday, air travel concessions. Written applications to Personnel Officer (U.K.), B.E.A., Keyline House, Ruislip, Middlesex. [9504

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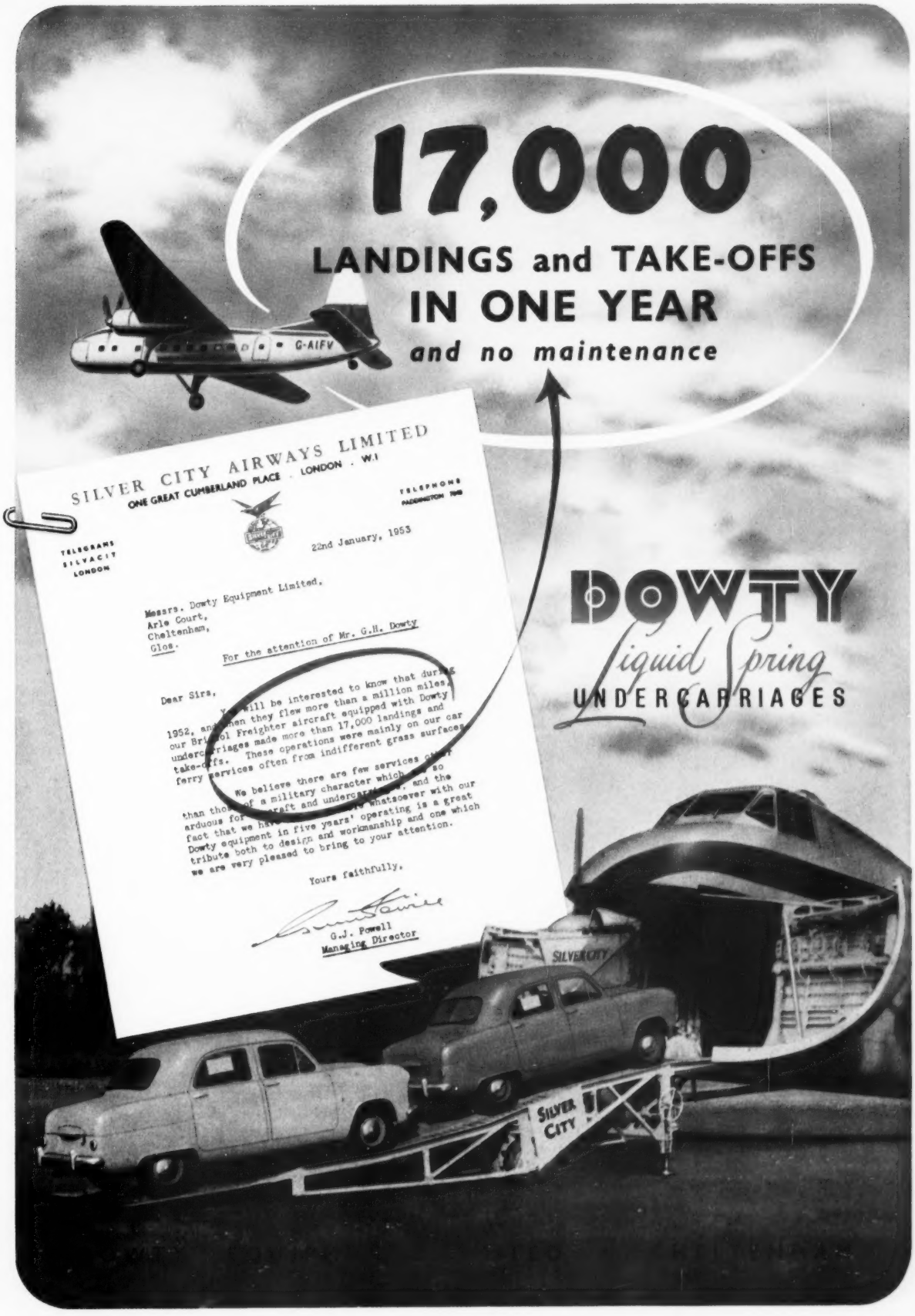
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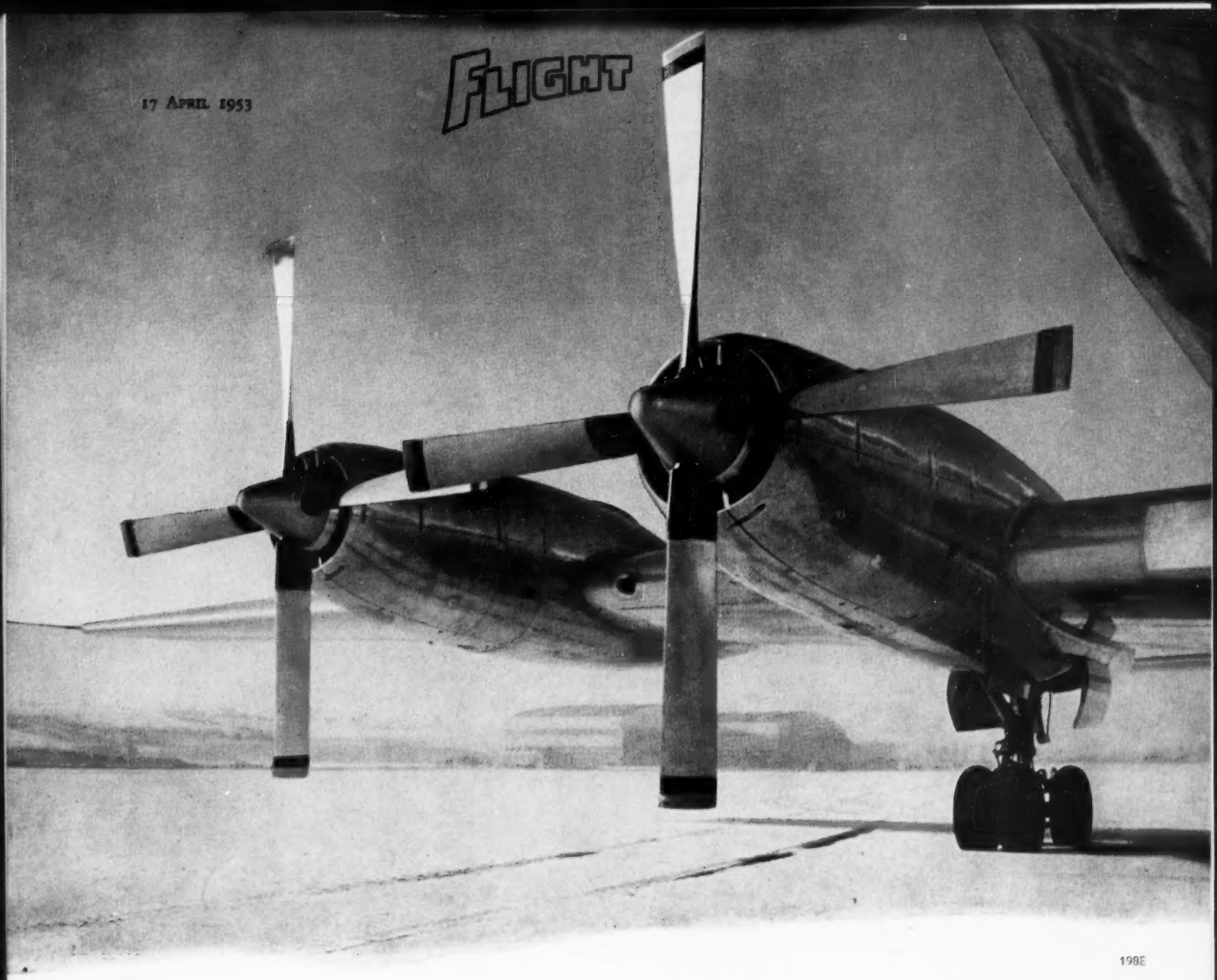

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